

RÉGION  
BOURGOGNE  
FRANCHE  
COMTÉ

# Hydrogen

Hydrogène  
BOURGOGNE  
FRANCHE-COMTÉ

aer  
regional economic  
agency of  
bourgogne-franche-comté

# DO YOU HAVE A PROJECT? BOURGOGNE-FRANCHE-COMTÉ WELCOMES YOU!



## set up shop

With its business parks and infrastructure, Bourgogne-Franche-Comté has all the assets you need to jump-start your projects in an environment designed for entrepreneurial innovation.

**No.1**

**INDUSTRIAL REGION  
IN TERMS OF JOBS**

**No.1**

**REGION IN  
CUTTING-DRAWING**

**6**

**INTERNATIONAL  
AIRPORTS  
NEARBY**

**9**

**HIGHWAYS FORMING  
A STRATEGIC INTERSECTION  
IN THE HEART OF EUROPE**

**451**

**KM OF HSR LINES  
14 TGV STATIONS**

**No.2**

**REGION IN  
MOULD, MODEL AND TOOL  
MANUFACTURING**

**No.3**

**REGION FOR  
MACHINE-TOOL  
MANUFACTURING**



The Bourgogne-Franche-Comté Region actively contributes to facing the challenges of the environmental and energy transition. Its commitment includes 90 million euros of dedicated financing and a roadmap developed and shared with all stakeholders in the Hydrogen ecosystem (businesses, laboratories, clusters...).

## 2 ASSOCIATED CLUSTERS AND 1 COMPETITIVENESS CLUSTER .....

### MECATEAMCLUSTER

The MecaTeamCluster is a national hub specialising in the **design, development and maintenance of heavy-duty railway machinery**. As part of its 'future of railway construction' programme, which aims to make railway construction site environments safer and improve their performance while reducing their environmental impact, MecaTeamCluster is studying **electrification solutions for vehicles and small equipment**. Among its preferred energy solutions, MecaTeamCluster is studying the feasibility of using hydrogen technology to provide new energy resources.

110

MEMBERS

€360k

ANNUAL BUDGET

### VALLÉE DE L'ÉNERGIE CLUSTER

Offering an exceptionally dynamic research and development environment as well as specialised education and training institutions, the Vallée de l'Énergie is a true **expertise cluster** supporting the development of a large **network integrating complex systems for the production, management and transmission of electrical energy**.

200

BUSINESSES

### PÔLE VÉHICULE DU FUTUR COMPETITIVENESS CLUSTER

The Pôle Véhicule du Futur Competitiveness Cluster is a **leading cluster for vehicles, mobility solutions and related services**. It brings together and coordinates an ecosystem of 420 members in the Bourgogne-Franche-Comté and Grand Est regions of France. It unites companies, public research organisations, educational bodies and regions together around collaborative projects focusing on innovation, industrial performance improvement programmes, and new training and skills, all with a business objective.

Since its creation in 2005, the Pôle has spurred on the Hydrogen and Hydrogen Fuel Cell dynamic in France-Comté and Bourgogne. Its goal is to **accelerate and further develop the industrial Hydrogen sector**. In partnership with the national bodies devoted to the subject, the AFHYAC and the Mobilité Hydrogène France coalition, the Pôle has participated in multiple studies and follows dedicated calls for projects.

420

MEMBERS

88,000

JOBS

## THE REGIONAL ECONOMIC AGENCY OF BOURGOGNE-FRANCHE-COMTÉ

The Regional Economic Agency works in close and harmonious collaboration with stakeholders in business development, innovation, training, and employment to:



**ASSIST**  
in maintaining  
and improving  
economic activity  
and employment  
in the region



**SUPPORT  
AND DEVELOP**  
innovation  
and eco-innovation



**BACK**  
economic  
development  
strategies  
of the region



**PROMOTE**  
the economic  
attractiveness  
of the region



# BOURGOGNE-FRANCHE-COMTÉ A FORWARD-LOOKING ECOSYSTEM

The earliest work on **Hydrogen Fuel Cell systems** in Bourgogne-Franche-Comté began in 1999 with the members of the **FC Lab** research federation (later known as **USR FC Lab**), associated with the **CNRS** (National Centre for Scientific Research).

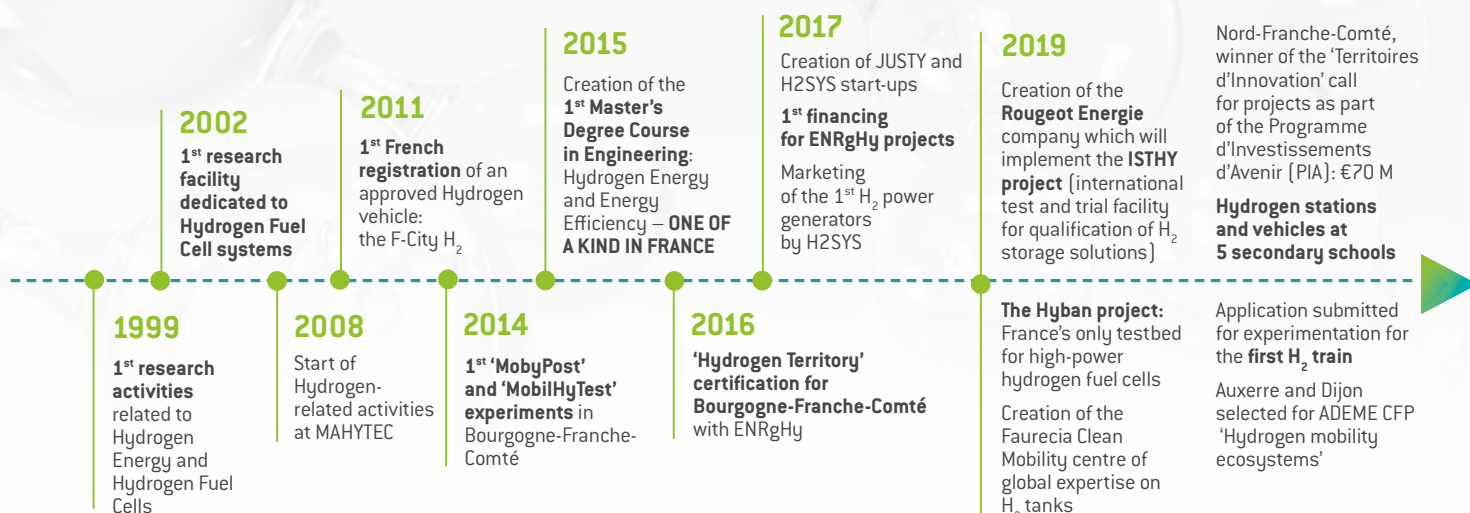
In 2016, the region was **certified as a 'Hydrogen Territory'** following a number of major demonstration projects that put the Hydrogen energy vector into practice in the region.

With support from the communities and clusters linked to the industry, a full-fledged **business, research and educational ecosystem** has developed around Hydrogen, with the objective of becoming a Net-Positive Energy Region by 2050.



## STRENGTHS of the region

- ✓ **PUBLIC RESEARCH AT THE HIGHEST INTERNATIONAL LEVEL**
- ✓ **TEST AND TRIAL CENTRES**  
=> Cells and tanks
- ✓ **COMMITTED INDUSTRY STAKEHOLDERS**
- ✓ **ACTIVE CLUSTERS AND COMPETITIVENESS CLUSTERS**
- ✓ **SUPPORT FROM LOCAL GOVERNMENTS**



## A FEW COMPANIES IN THE INDUSTRY



### VEHICLES



ALSTOM  
ARQUUS  
GAUSSIN  
LAMBERET  
PACKMAT  
VALMÉTAL



### STORAGE



FAURECIA  
MAHYTEC  
PLASTIC OMNIUM  
ROUGEOT ENERGIE  
SCHRADER



### ENERGY SUPPLIERS



AVIA  
DATS 24  
EDF (HYNAMICS)  
ENGIE  
GEST'HYDROGÈNE  
H2SYS



### COMPONENTS



DELFINEN  
DEPHIS  
PRESSE ÉTUDE  
STREIT  
TECHNITUBE



### ENGINEERING



H2SYS  
JUSTY



## BUSINESSES

50

BUSINESSES

500

JOB



## RESEARCH & INNOVATION

5

LABORATORIES

1

HYDROGEN FUEL  
CELL  
FACILITY



## PROJECT ASSISTANCE

1

COMPETITIVENESS CLUSTER  
FOCUSED ON THE VEHICLES  
OF THE FUTURE

2

CLUSTERS  
LINKED TO  
THE INDUSTRY



## EDUCATION

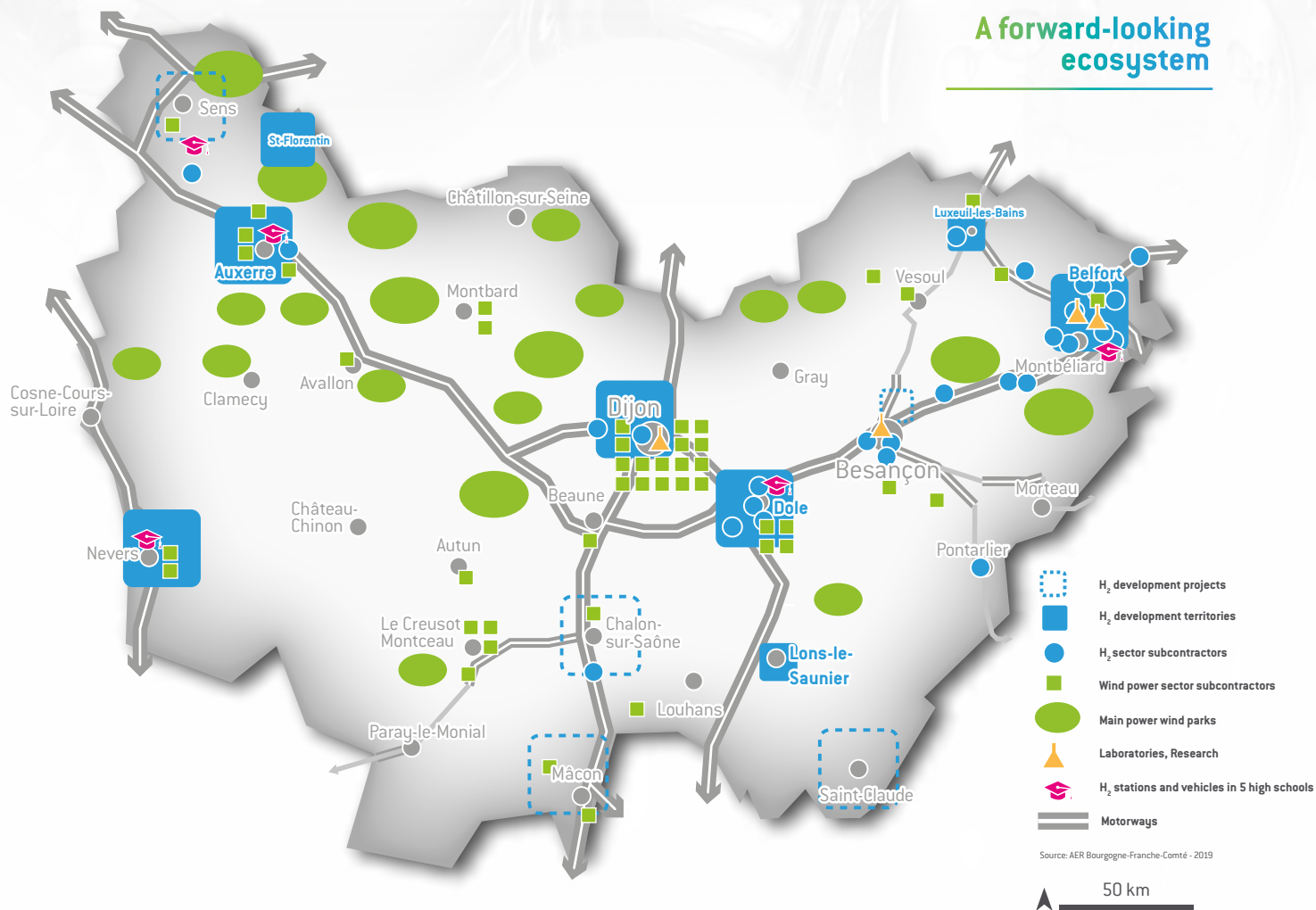
1

PROGRAMME IN  
HYDROGEN  
ENERGY

4

ENGINEERING  
SCHOOLS  
LINKED TO THE INDUSTRY

## A forward-looking ecosystem



BOURGOGNE-FRANCHE-COMTÉ

# HYDROGEN IS IN OUR GENES!



## FEMTO-ST INSTITUTE

FIRST CNRS LAB FOR HYDROGEN ENERGY AT THE NATIONAL LEVEL

Hydrogen energy systems, hydrogen fuel cell systems, solid hydrogen storage, materials for hydrogen fuel cells, H<sub>2</sub> business models, H<sub>2</sub> system optimisation, static energy converters, diagnostics and forecasting for H<sub>2</sub> systems, integration of H<sub>2</sub> into transport and stationary applications.

## FAURECIA CORE CENTER FOR H<sub>2</sub>

CENTRE OF GLOBAL EXPERTISE

A centre of global expertise for the development of **hydrogen storage systems**, next-generation high-pressure tanks, and a characterisation test centre for these tanks.

## ICB LABORATORY

METALLURGICAL PROCESSES, DURABILITY, MATERIALS

Developing advanced materials, studying their durability, processes and reactivity phenomena at solid/solid and solid/gas interfaces.

a cutting-edge scientific  
and technical environment

## USR FCLAB

HYDROGEN FUEL CELL SERVICES AND RESEARCH UNIT

Serves to link 6 national laboratories specialising in Hydrogen Energy. Supported by UTBM's Hydrogen Fuel Cell facility, it is **the only unit in Europe to combine highly advanced research and engineering** in this subject area in a public structure at this scale.

## UTBM HYDROGEN FUEL CELL FACILITY

**One of Europe's largest public facilities for research, testing and industrial transfer** in connection with **Hydrogen Fuel Cell systems** (900 m<sup>2</sup> of testing space for test powers from a few watts up to nearly 200 kW).

This facility aims to further increase its industrial activity, in part by offering manufacturers new means of testing H<sub>2</sub> systems, but also by supporting our partners in **training** their employees and **certifying** their products.

## ISAT DRIVE LABORATORY

DEPARTMENT OF RESEARCH IN VEHICLE ENGINEERING  
FOR THE ENVIRONMENT

Optimisation of propulsion energy, smart and connected systems, composite materials and durability, vibratory and acoustic behaviours.



# BOURGOGNE-FRANCHE-COMTÉ INDUSTRY COMMITMENT



The local presence of an industrial network specialising in **metals and materials processing** and expertise in **surface treatment** are valuable assets for providing **complete manufacturing of the Hydrogen systems of tomorrow**.

**Metal pipework, polymer membranes, valves, sensors, surface treatment and microtechnology** are all areas of expertise found in the region, ensuring its future potential for Hydrogen and the Hydrogen Fuel Cell environment.

## innovative businesses\*

### ALSTOM

Development of a Hydrogen version of its new Prima H4 locomotive

### DELFINGEN

Fluid transfer solutions for adaptation to Hydrogen applications

### DEPHIS

Protective ceria coatings for hydrogen fuel cell components

### GAUSSIN

Custom industrial logistics solutions, Hydrogen / battery technology for 250 kW of power

### H2SYS

Hydrogen-fuelled hybrid electric generators for a power range from 1 kW to 20 kW

### JUSTY

Design firm specialising in training, project engineering and services in the wind power and hydrogen sectors

### MAHYTEC

Hydrogen tanks and storage technologies for mobile and stationary applications

### PRESSE ÉTUDE

High-precision tools for bipolar plates for hydrogen fuel cells

### ROUGEOT ÉNERGIE

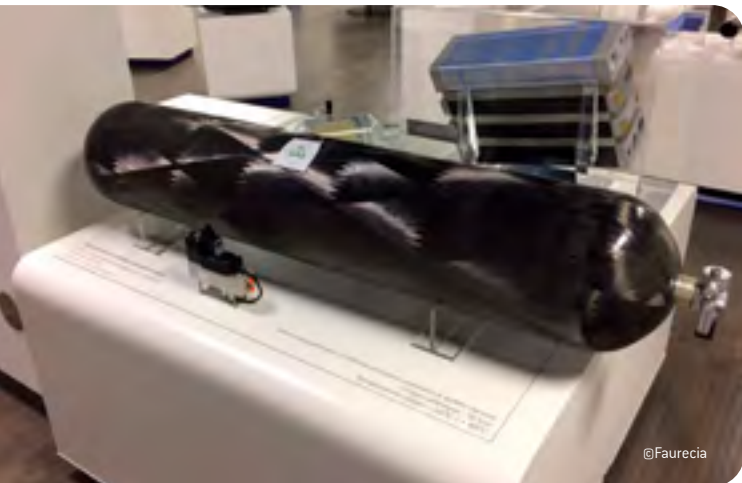
Turnkey solutions for making the energy transition with hydrogen

### SCHRADER PACIFIC

High-technology valves and safety devices for high-pressure storage systems

### STREIT

Design, machining and assembly of mechanical components, including components for hydrogen fuel cell systems



## Bourgogne-Franche-Comté, Europe's leader for hydrogen fuel cell and tank testing

### HYBAN

TESTBED FOR HIGH-POWER HYDROGEN FUEL CELLS

Operating since 2019, Hyban is an **industrial Hydrogen Fuel Cell testbed** for **high-power** PEMFC and HT PEMFC fuel cells (100-120 kWe). This unique and indispensable tool for placing 'full fuel cell power' vehicles on the market adds to the test and validation methods offered by the **Hydrogen Fuel Cell Facility in Belfort**.

### ISTHY

NATIONAL HYDROGEN STORAGE INSTITUTE

Backed by the Rougeot Energie company, ISTHY will be **France's centre for testing, certification and periodic requalification of tanks and components in the Hydrogen cycle**. It will also serve as a **training and R&D centre** to help anticipate technological developments.

### FAURECIA CENTRE OF H<sub>2</sub> EXPERTISE

A major player in the automotive industry, FAURECIA is creating its own **centre of global expertise dedicated to the development of hydrogen storage systems** at its R&D centre in Bavans, near Montbéliard. With this project, Faurecia intends to invest in research and development of lighter, higher-performance **next-generation high-pressure tanks**, and in a characterisation test centre for these tanks.

## innovative projects

### HYCAUNAIIS

1<sup>ST</sup> PROJECT TO COMBINE ANAEROBIC DIGESTION AND METHANATION

A project for upcycling the waste CO<sub>2</sub> present at the Saint-Florentin (89) landfill site by means of **methanation**. The Hydrogen needed for this process is itself a product of wind power production.

### VHYCTOR

REFUELLING STATION WITH CO-PRODUCED HYDROGEN

Construction of a **Hydrogen refuelling station supplied by a source of industrial co-produced gas** transported under high pressure.

### TH90

VIABLE HOUSING POWERED BY CARBON-FREE HYDROGEN

Construction project for a new demonstrator building (15 flats) equipped with a system for hydrogen production, storage and use for heating and domestic hot water. A second control building, identical to the first but without the innovative technology, will be built at the same location. Both buildings will be equipped with measuring equipment for use in comparative studies.

### PRIMA H4 – HYDROGEN VERSION

LOCOMOTIVE MANUFACTURED BY ALSTOM BELFORT

Alstom's Prima H4 bimodal locomotive is designed for switching and track-work tasks. Currently powered by an electric drive system and two diesel generators, the teams at Alstom Belfort are currently working on a version that can run on a Hydrogen fuel cell.





## advanced local ecosystems

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### AuxR H<sub>2</sub> – AUXERRE

PILOT PROJECT IN FRANCE COMBINING WIND AND TRANSPORTATION

Creation of a multimodal (water-electrolysis) **Hydrogen production, storage and refuelling station powered by renewable energy**. Certified at the European level, the project will put 5 Hydrogen-powered buses on the road in the initial phase, and ten utility vehicles.

### 'TTI' PROJECT

A PROCESS OF COLLECTIVE INTELLIGENCE

The Pays de Montbéliard Metropolitan Region and the Greater Belfort Metropolitan Community seized the opportunity provided by the PIA 3 'Territoire d'Innovation' call for projects to present their winning '**Transformation d'un Territoire Industriel**' (TTI) or 'Transformation of an Industrial Region' project, with continued development of the Hydrogen sector as one of its major axes. The project includes a number of activities related to the **deployment of Hydrogen technologies for mobile and stationary applications**, as well as activities to support the development of industrial offerings. Major accounts like Alstom, Faurecia and PSA are associated with it.

Nord Franche-Comté will take advantage of Hydrogen fuel cell innovations in a wide range of different ways, e.g. by deploying a **Hydrogen-powered bus** in Belfort, eventually replacing its urban fleet; **intercity university buses** between Belfort, Sévenans and Montbéliard; a **multimodal Hydrogen station** in Belfort; building the future **European centre for Hydrogen certification** (ISTHY); and more.

### DIJON SMART ENERGY

HYDROGEN-POWERED BIN LORRIES

Development of a **Hydrogen ecosystem** in Greater Dijon with **mobile applications** (household refuse collection lorries, buses, lorries, light vehicles, etc.) and **stationary applications**.



# BOURGOGNE-FRANCHE-COMTÉ TARGETED TRAININGS



## A MASTER OF ENGINEERING COURSE THAT'S ONE OF A KIND IN FRANCE

The **Hydrogen Energy and Energy Efficiency CMI** offered by the University of Franche-Comté is a 5-year programme in the **energy production and management** engineering trades for students who will become experts in the **fields of energy efficiency and clean energy, with specific expertise in Hydrogen Energy** (production, transport and stationary applications, etc.).

A high-level and very selective programme from which the first cohort of students graduated in 2019.

## HYDROGEN STATIONS AND VEHICLES IN 5 REGIONAL SECONDARY SCHOOLS

To prepare for the future, educating younger generations is a must. The Bourgogne-Franche-Comté Region has launched a programme to implement **complete Hydrogen Energy solutions, both for energy storage and for mobility**, in 5 secondary schools.

The company MAHYTEC has responded by bringing together other companies and regional expertise to propose a 'turnkey' solution consisting of **a dual-use station for the storage and restoration of electrical energy through a hybrid 'Hydrogen Fuel Cell and batteries' system**. This station will also supply Hydrogen to a quadricycle that can transport a large payload. This programme will provide both educational activities for students and new functionalities for high schools. Through this system, students will acquire full-scale knowledge of Hydrogen Energy technologies for the secondary schools of the 21<sup>st</sup> century.





training focused on  
the needs of the market

### UNIVERSITY OF FRANCHE-COMTÉ

**Has an educational facility and offers an H3E CMI (master of engineering course) dedicated to Hydrogen Energy** (see facing page)

From the DUT (technology diploma) to the Master's level, the UFC provides courses focusing on renewable energy and energy efficiency.

### UTBM (BELFORT-MONTBÉLIARD)

BELFORT-MONTBÉLIARD UNIVERSITY OF TECHNOLOGY

- › **Energy sector:** Energy production, Networks, conversion and storage, Transport and embedded energy systems
- › **2 educational facilities:** Electromagnetic compatibility, Energy and land transport
- › Electrical Engineering by apprenticeship
- › 1 Master's Degree course in Electrical Energy

### ENSMM (BESANÇON)

A GENERAL ENGINEERING UNIVERSITY SPECIALISING IN MECHANICS AND MICROTECHNOLOGY

- › Two engineering diplomas with the status of apprentice, with a speciality in Mechanics and a speciality in Microtechnology and Design.
- › Specialisation options: Structural mechanics, Creation of connected objects, Materials and surfaces, Mechatronics and robotics, Engineering of production systems, Micromechanics, Innovation engineering, Process engineering

### ARTS ET MÉTIERS CAMPUS (CLUNY)

- › Studies in mechanical, industrial, and energy engineering



### UNIVERSITY OF BURGUNDY

From the DUT (technical diploma) to the Master's level, the UB provides courses in the physics of materials as well as civil and mechanical engineering.

### ISAT (NEVERS)

HIGHER INSTITUTE OF MOTOR VEHICLES AND TRANSPORT

- › Engineering studies at an international level for the entire automotive and transportation industry: innovation and R&D, industrialisation and production, vehicle operation
- › Specialisations in technical procurement and redesign, vehicle comfort and behaviour, vehicle energy and the environment, ergonomics and biomechanics, industrialisation, infrastructure and transport networks, logistics and industrial production, materials and structures, smart and autonomous vehicles, process safety and maintenance
- › Department of Research in Vehicle Engineering for the Environment (DRIVE): see page 6

### ESIREM (DIJON - LE CREUSOT)

HIGHER ENGINEERING INSTITUTE SPECIALISING IN INFORMATION TECHNOLOGY, ROBOTICS, ELECTRONICS AND MATERIALS

- › Materials: R&D or product industrialisation, from design to recycling (sustainable development)
- › IT/Electronics: specialisations in Embedded Systems, Network Security and Quality, Software and Knowledge Engineering
- › Robotics: modelling and simulation, functional and mechanical design, system autonomy, ...





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