

MASTER OF SCIENCE  
AND ENGINEERING (MSE)



# SMART & RESILIENT CITIES FOR AN INNOVATIVE SOCIETY



SMART & RESILIENT CITIES MASTERS' DEGREE

2



# WELCOME TO AN IMMERSIVE EXPERIENCE....



To study at HEI is to know that you will ground your academic credentials in a range of real-life experiences and the professional challenges which reflect market situations.

In the SMART Cities Masters degree, you will focus on tomorrow's cities from multiple viewpoints, as you will discover in the following pages.

As the range of issues in architecture and planning projects increases, so does the range of professionals involved, which in turn increases the complexity of projects. Future stakeholders of city planning must first experience and practice new collaboration tools before they can successfully integrate the professional world. They need new skills, new ways of working, the ability to take into consideration other perspectives and to step out of their comfort zone.

The SMART Cities Masters' degree embodies HEI's desire to prepare students to become open-minded and well-rounded professionals with a realistic and inspired approach to technology and its' environmental, ethical and societal challenges.

After HEI, not only are all of our students prepared to take on projects and manage teams of experts, but they also benefit from the emphasis we place on the soft skills needed to take on the complex challenges of the workplace.

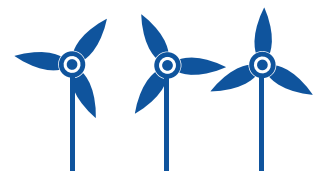
Our modern and pragmatic study program, combining architecture and engineering, personal development and technical expertise, trains professionals who are able to produce these collaborative results.

Several trends are emerging in the context of urban design, from 'optimistic technological visions' to 'ecological resilience'. We believe that whatever the scenario, the next generation of proposals will have to address and blend together these technological and social parameters.

Yncrea and HEI are delighted to be able to offer the international, innovative and inspiring courses of the SMART & Resilient Cities Masters degree with the excellence of French Tech, and hope to welcome you on this program very soon.

Ana Ruiz-Bowen  
Program Director

3





4

DISCOVER  
INTERDISCIPLINARY  
EXCELLENCE IN  
ENGINEERING



## HEI

HEI was founded in Lille in 1885 by the Industrial Leaders of Northern France. HEI has since extended its activities to the training of multi-disciplinary engineers who share a curiosity for the world and its people, and managers with a future-facing, international mindset.

HEI's close collaboration with private business and industry enables the applied knowledge and creativity of students to create competitive advantages for themselves and the businesses they work for by fostering innovation and developing competency at all levels.

## YNCREA

With 4600 students, 28 000 graduates and 23 research laboratories, Yncréa Hauts-de-France is one of the largest private not-for-profit higher education associations in Europe. HEI, ISA, and ISEN Lille are the well established engineering schools within the association, all recognised for their ability to innovate, the quality of their research, their collective intelligence methods, and their openness and understanding of the world we live in.

*"Yncréa provides an answer to numerous priorities of engineering education: interdisciplinary studies, digitalization, agility and speed in project development, research, openness to the world, critical mass...so many fundamental subjects to which Yncréa offers a tailored response, unique in France."*

Gérard Jousset, President of Yncréa

## THE CAMPLUS

Yncrea is undergoing a radical and future-proofing transformation which will see many new features appear on the campus of the Catholic University of Lille by 2024. The new campus is set to become a cutting-edge hub of teaching, innovation, research and demonstration, which integrates the landmarks of the historic campus into forward looking redesign.

« Demonstration » is the connection between a functional space and a community of users, whether they are researchers, students, businesses or neighbours. By sharing this space, their ideas will meet and lead to new, better solutions.

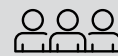
In these living labs, concepts will be developed, projects refined, products prototyped, tested, incubated... in realistic conditions.

The campus will turn entire buildings into research and experimentation spaces, dedicated to collaborations between students, researchers and partner businesses and include:

- an urban greenhouse
- a smart house
- a factory of the future
- a fab lab



### YNCRÉA HAUTS-DE-FRANCE KEY FIGURES



Almost **5,000** students and apprentices



**26,000** graduates

**3** engineering diplomas

**40** areas of professional training



5



**23** research teams, co-trustee for **4** research laboratories of the region's Grandes Ecoles and universities and the

**CNRS**



Almost **300** international partner universities

**400** permanent employees



Consolidated budget of **€45,000,000**



6

# STUDY AT THE HEART OF EUROPE



## LILLE : A CITY LAB AT SCALE 1

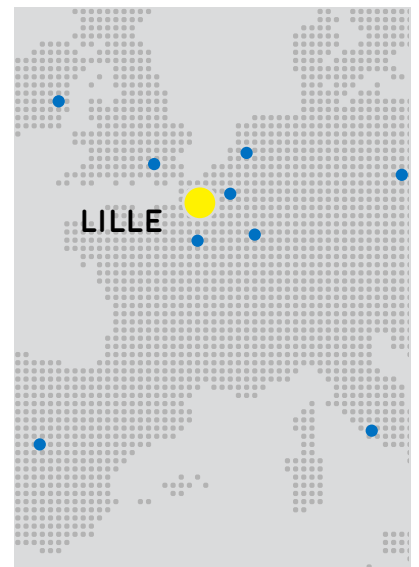
Lille's rich industrial past and central situation in Europe (MAP) has put it at the heart of a rich web of transport links and some of today's most dense post-industrial development challenges.

The Métropole Européenne de Lille leads an ambitious environmental policy which combines energy efficiency and the development of renewable energies. Our region, a leader in the digital domain, wants to become one of the main digital hubs in France by obtaining the French government's 'French Tech' label.

As a Smart City 'Lab', the city of Lille already boasts modern and innovative development projects and a booming network of international companies whose success creates a range of complex engineering challenges locally.

Thanks to the unique geographical position of Lille, exploration trips are made possible to inspire and understand the bigger picture, and to gain insights from other parts of Europe.

These projects, both in Lille and beyond, enable students to work on real sites as teams, with other professions and other cultures, during their degree.



### FACTS ABOUT LILLE EUROPEAN METROPOLITAN AREA

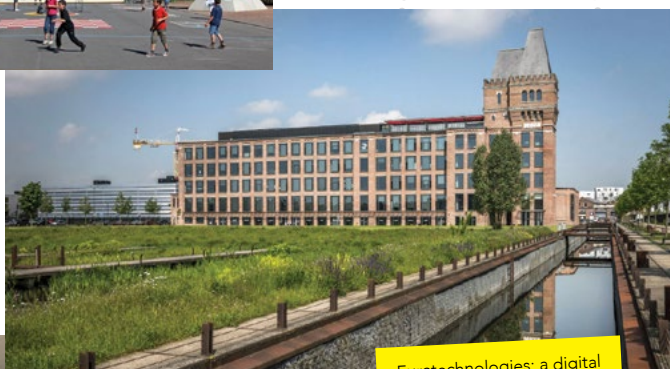
**90** towns  
**200000 M2** urban space in transformation

over a **1 000 000** residents across a urban and rural region, composed of large cities and villages.

Crossroad of Europe  
**110** km from Brussels  
**225** km from PARIS  
**280** km from London  
**300** km from Amsterdam



Gare Saint-Sauveur: third place and cultural site hosting LILLE 3000.



Euratechnologies: a digital innovation cluster.



Five Cail: workshop with Lille Metrople partners of the renovation program.





8

# DESIGN TOMORROW'S CITIES

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**A multidisciplinary program**

**LEARN TO LEAD CHANGE**

Cities are in a constant transformation process and adapt continuously to new paradigms. We are currently living in the fastest ever-changing context ever recorded, and it is universal. Technological, social and economic upheavals are happening day after day. Several trends are emerging in the context of urban design, from 'optimistic technological visions' to 'ecological resilience'.

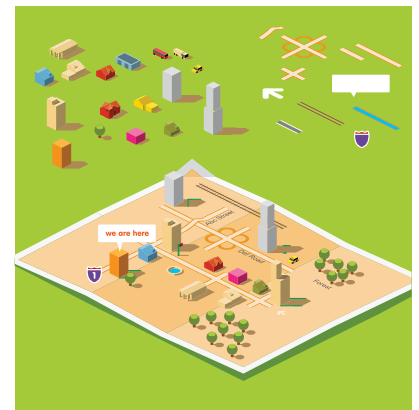
We believe that whatever the scenario, the next generation of proposals will have to address and blend together technological and social parameters.

The designers of tomorrow's cities, the engineers of tomorrow, need to keep their minds open to the world, and to everything which affects the way we live.

This master's degree prepares students to develop urban areas by integrating energy usage and efficiency, the use of new energies and technologies, and environmental planning into their thinking. The course also enables future professionals to be involved in the conception of complex and multi-disciplinary projects.

That is why the SMART Cities program is so unique: it prepares engineers, architects and urban planners to think of the world they are designing for, not just what they are designing.

The MSE-Smart Cities, entirely in English, equips international students with the skills and competencies needed to succeed in our changing world.



**+** **Develop** analytical and planning skills within the context of an eco-neighbourhood.

**+** **Learn** how to contribute to an urban project from an environmental point of view.

**+** **Understand** the holistic approach to resource management.

**+** **Deepen** your understanding of energy and the stakes involved.

**+** **Enrich** the applications in buildings.

**+** **Integrate** production and distribution of renewable energies.



*«Everything is Smart in the Smart Cities: smart economy, smart people, smart government, smart mobility and smart environment... the HEI Smart Cities Master is a smart higher education program that consolidates entrepreneurship spirit and personal enrichment to question our future.»*

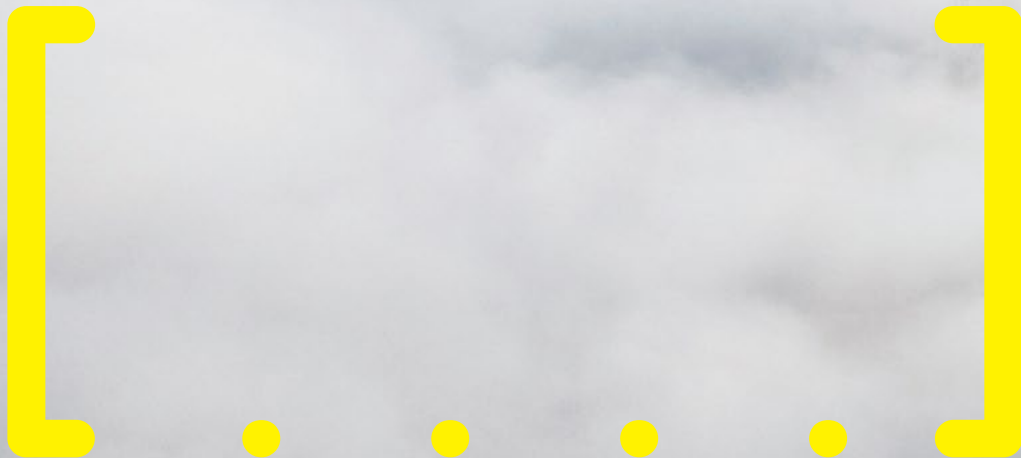
**Catherine Chardon**  
Managing Director, RATP Dev, London.



# REDEFINE YOUR BOUNDARIES



10



## Teaching & learning methodologies

### CREATIVITY AND COLLABORATION ARE YOUR NEW NORMAL

Today a single discipline cannot meet all the emerging technical, social and economic needs of a city. Therefore, smart cities require the combination of multiple skills from a variety of stakeholders, who must learn to cooperate and work together. New collaborative and innovative working methods and spaces are employed in order to confront the reality of smart cities.

### TEST YOUR ABILITIES IN CONTEXT

The program includes completion of a full-time team project and professional internships with a company or laboratory in France or abroad.

### SUBMIT REAL PROPOSALS FROM YEAR ONE

Studio workshops are proposed on a real site with the associated actors (1 studio/year). The students will propose and design eco-districts and buildings, taking into account environmental issues, integration and context (social, economic, landscape), and architectural quality in a broad sense.

### BROADEN YOUR VIEW OF THE WORLD

Students will participate in an intensive international learning trip to discover innovative ecosystems in cities such as Montreal, Barcelona, Nice... From its' ideal location at the heart of European the Smart Cities Program will integrate exploration trips from Lille to other European cities.



## TEACHING & LEARNING METHODOLOGIES



EXPERIMENTAL  
APPROACH



WORKSHOPS



LEARNING  
EXPEDITIONS



FIELD TRIPS



CONFERENCES



**DELIVER FIRST ASSIGNMENTS**

**< DECEMBER**

**Architecture & urbanism field trips**  
Discover other European cities  
Learn about  
- sustainable mobility: planning, operating and innovating  
- Architecture, construction and sustainable design  
Meet companies & start networking.

**< NOVEMBER**

Get started on your professional project, step into:  
- Fundamentals of energy and renewable energies,  
- Transport and mobility issues: economy, impacts, policies and uses.

**JANUARY >**

Study technical subject in more detail  
- Urban project management  
- Ubiquity and the internet of things  
- Dynamical thermal simulation and HVAC  
- Building management systems and home automation  
- BIM.

**FEBRUARY >**

Participate in a **learning expedition** & an international seminar: «Future cities: smart, inclusive and sustainable»  
  
**STUDIO 2**  
2nd major project begins.

**YEAR 2**

12

experience the full picture of Smart & resilient cities

**STEP INTO A NEW LEARNING EXPERIENCE**



**< DECEMBER**

**Learning expedition**  
discover about other approaches in different contexts and cities.

**JANUARY >**

YES project:



**SUSTAINABLE URBANISM**

Understand the sociology of urban development, protocols and accords. Urban Planning and land use, urban projects. History of urban development, dynamic and multidisciplinary approach of eco-districts.



**BUILDING SCIENCES**

Understand bioclimatic architectural design of building envelopes; develop knowledge of smart building and home automation, domotics, and the sustainable habitat. Develop skills to perform building energy audits, diagnostics, climatic engineering, and modelization, energy requirements and building renovation.

YEAR 1

Laying the ground for Smart & resilient cities

< OCTOBER

Experience seminars, creativity, innovation.  
**Lille World Forum Congress**

< SEPTEMBER

Discover the full range of classes, facilities and experiences.

**STUDIO 1**

1st major proct begins

MARCH >

Build on yor technical knowledge with a cycle of **conferences about major urban challenges**.  
Discover philosophy for engineers:  
- ethics, meaning, city,  
- circular Economy.

APRIL >

MAI >

JUNE >

Internship: 3 to 4 months.



PROFESSIONAL EXPERIENCE

< NOVEMBER

Town planning :  
- Socio-political approach of the city  
- Smart Grid, and energy management at bulding scale  
- Urban environment principles.

< OCTOBER

Environnemental engineering :  
- Water Management, Landscaping and green spaces  
- Certification and environmental footprint.

< SEPTEMBER

**STUDIO 3**  
Start your 3rd major project.

13

Ready to start

FEBRUARY >

MARCH >

APRIL >

MAI >

JUNE >

a collaborative inter-school work focusing on research and/or companies issues.

Final internship: 4 to 6 months.

SUCCESS



**INNOVATION IN AN URBAN CONTEXT**

Master the tools, concepts, advantages and limits of project management and implementation, collective intelligence, collaborative projects. Project organizational dynamics. Computer assisted decisionmaking. Building Information Modelling.



**TOOLS FOR ENGINEERING MANAGEMENT**

Innovation management, Team management, Project management, Quality management, Accounting, Marketing, Intercultural communication...

AND DEDICATED  
FACILITIES



# MEET OUR EXCEPTIONNAL STAFF

## INVITED SPEAKERS COMING FROM EDUCATION AND PRACTICE

Our cross-disciplinary faculty, illustrious guest speakers and different immersive learning methods will stimulate creativity and the necessary problem-solving skills for designing cities in a world perpetually in motion.

### **Montserrat Pareja Eastaway**

Professor of Economics  
at University of Barcelona,

### **Didier Larue**

Landscape Planner consultant  
at AtelierLD,

### **Noel Bramley**

Artist and Professor  
at University of The Arts, London,

### **Victor Jumez**

Environmental engineer and Founder  
of Symoe,

### **Francois Laurent Touzain**

Engineer, Business Developer and  
Founder of 360°,

### **Oliver Page**

Architect and International  
Development director at SCAU,

### **Grahame Baker**

Principal Lecturer  
University of Greenwich,

### **Ouafia Djebar**

Architect and Partner of L'Agence  
Française d'Architecture

### **Collette Saba**

International Development  
Consultant,

### **Syrine Ismaili Bastien**

Environmental Law Consultant,

### **Thomas Batorie**

Environmental engineer at Fédération  
Française du Bâtiment,

### **Philippe Tostain**

Ecomobility Consultant.

### **Program Director**

Prof. Ana Ruiz Bowen  
*Yncrea Hauts-de-France*

### **Coordinator**

Prof. Zheng Tan  
*Yncrea Hauts-de-France*

### **A DEDICATED STUDIO FOR THE MASTER'S**

Within the main HEI building, our Master's has a dedicated studio which enables learning experiences to be shared and developed collectively.

### **A CO-DESIGN CENTRE**

The co-design centre enables students to experience experimental and user-centric methodologies for innovation management, in the 'Euratechnologie' area (Lille's official innovation and digital excellence cluster).

### **A FAB-LAB**

Yncrea's 60 m<sup>2</sup> Fab-lab (fabrication laboratory) offers (personal) digital fabrication. The facility is at the heart of the campus and offers a range of rapid prototyping tools (3D printer, laser engraver, laser cutting, printed circuit board engraving machines, etc.) and a 'tech-library'.





# SHARE THE POWER OF CONNECTION

16





## DEVELOP YOUR OWN NETWORK

The Smart cities master has an outstanding faculty and regularly provides lectures from best professionals in the field – as well as many opportunities to interact with important companies and be noticed by them.

There's always a lot of activity going on at the Yncréa Campus and strong relationships are built with the «real» world. During your master you are very likely to encounter a large range of professionals from the following companies:

Aérocentre | Atos | Biion | Bonduelle | Bouygues Construction | Bouygues Energies | Capgemini | Castorama | CGI | Colas | CSO Energy | Décathlon | Eiffage Construction | Eiffage Energies | Eurovia | Groupe Fayat | Léon Grosse | Rabot Dutilleul | RTE | Sopra Group | Sylvagreg | Syntec | Technord | Toyota | Vinci Construction | Vinci Energies | and more...



## BS NODESSG - INDUSTRIAL CHAIR

At the heart of Catholic University of Lille, is hosted the the SBnodesSG (Smart Buildings as nodes of Smart Grids) Industrial Chair. Launched by Yncréa Hauts-de-France and 10 actors from the economic sphere, with MEL support. The vocation of the SBnodesSG chair is to improve user comfort and energy efficiencies by incorporating connected objects and big data in the intelligent management of buildings and energy networks. The project aims to explore the potential for intelligent buildings as Smart Nodes within intelligent energy networks or Smart Grids.



## SOME CAREER IDEAS



## STAY IN TOUCH WITH THE ALUMNI NETWORK

The HEI Alumni network is an independent entity dedicated to supporting students both during and after their studies.

HEI Alumni's purpose is to lead a solidarity network (of nearly 20 000 Alumni!), to help you with your career, to strengthen links between Yncrea and companies, and to give guidance on your professional project.

Some companies where our Alumni work

**SINTEO**  
Sustainable building and CSR engineer

**TRACTEBEL - ENGIE GROUP**  
Business Developer & Sales Engineer - Urban

**ARP-AASTRANCE**  
Smart buildings design manager - Co-founder of campus market, a circular economy business

**VINCI IMMOBILIER**  
Deputy Development Manager

**EIFFAGE ENERGIE SYSTÈMES**  
Business engineer,

**LEGENBRE UK LIMITED**  
Site manager

**SOLENER**  
Project manager (sustainable building)

**LINKCITY Île-de-France**  
Urban projects manager

**CONSTRUCTION 21**  
Innovation project officer - infrastructure and sustainable cities

**BOUYGUES ENERGIES & SERVICES**  
Smart City project manager

**CALQ Architecture**  
Works supervision assistant

**IES LTD**  
Urban Simulation Assistant

*"In this Master's, the pedagogic approach is completely different from a traditional engineering program because we are able to work on various innovative urban projects."*

**Gaëlle Thibault**  
SC student - HEI Lille

18

# GET READY TO APPLY

**Clement Chardon**  
SC student - HEI Lille

*« I spent 2 amazing years in the Smart Cities Master's at HEI. It taught me to learn differently : based on projects, we learned by ourselves and with others. We learned about energy, the internet of things, smart grids, the environment, urbanism, architecture, sociology and much more. Come and join us in this incredible master's, where we learn the future missions of the cities ! »*

**Sofiane EL KADAOUI**  
SC student - HEI Lille

*« Our minds are opened to the society and environmental issues in cities thanks to inter-disciplinary classes and practical applications in innovative, life-sized projects »*



# ADMISSION PROCESS



**APPLY NOW !**  
request for admission by e-mail:  
[hei.master.smartcities@yncrea.fr](mailto:hei.master.smartcities@yncrea.fr)



**INTERVIEW**  
Our team review  
your application and invite you to an  
interview (in-person or online)



**ADMISSION**  
You will be notified of the final  
decision on your application

**APPLY BEFORE 15 MAI 2020**

## KEY COURSE INFO

### Qualification awarded:

Master of Science and Engineering

**Duration:** 2 years (120 ECTS)

**Language of instruction:** English

**Start date:** September 2020

**Intake:** 30 students

**Tuition fees:** 11 000€ /year

Professional paid internships with  
companies in France or abroad :  
up to 10 months.

### Program director:

Prof. Ana RUIZ BOWEN

### Admissions information

[hei.master.smartcities@yncrea.fr](mailto:hei.master.smartcities@yncrea.fr)

## ENTRY REQUIREMENTS

Bachelor's degree (or equivalent)

in the field of Engineering or Architecture.

English B2 level ie. BULATS 60, TOEIC 785, TOEFL 87.





**HAUTES ETUDES D'INGENIEUR  
YNCREA HAUTS-DE-FRANCE**  
13 rue de Toul - BP 41290  
59014 Lille Cedex - FRANCE  
Tél. 03 28 38 48 58  
hei.master.smartcities@yncrea.fr

**WWW.HEI.FR**