ONLINE SPRING SCHOOL

From 6th to 18th February 2023

20hrs – 2 ECTS

To Apply to this online program:
Make sure your time zone allows you to attend the classes live from 8am to 12pm (France)

LYON – AN ESSENTIAL EUROPEAN CITY

When you choose Lyon, you choose one of the most attractive cities in Europe, an international competitor and a gateway to the rest of the world. Being France's 2nd most important city, it is located in the heart of the thriving Auvergne-Rhône-Alpes region. The city was classified as World Heritage Site by UNESCO in 1998. Ancient capital of the Gauls, it testifies of 2000 years of history. Lyon has been recognized as France's 1st city for culture outside of Paris and is indeed characterized above all by the balance between its cultural institutions of excellence offering quality programming, its large-scale festivals, and its cultural venues open to all.

With its many fields of excellence, Lyon is a major international hub: Life Sciences, Clean technologies, Tertiary sector, ITC to name a few. The city is also home to internationally-renowned companies and major players, including: Sanofi, Mérial, Lafarge, GL Events, Bank of China, Solvay Rhodia. In addition, many world-renowned organizations have chosen Lyon as the location for their headquarters: Handicap International, World Health Organization, CIRC (International Cancer Research Center), Interpol, Euronews.

Lyon is also a favorite city for foreign students who represent 10% of the student population in Lyon and strengthen the city's international character.

INSA LYON – A LEADING ENGINEERING SCHOOL IN FRANCE

INSA Lyon is amongst the greatest French universities for science and technology. Our five-year program trains multi-skilled, humanist, innovative engineers equipped with an entrepreneurial spirit and a strong international culture.

Diversity, excellence, openness and innovation are the driving forces that lead INSA Lyon students to become responsible engineers. Created by the philosopher Gaston Berger and Rector Jean Capelle, and after 65 years of existence, INSA Lyon embodies an avant-garde and resolutely modern vision of engineering.

INSA engineers boast excellent scientific and technical expertise, are capable of understanding the issues at the heart of their companies, and actively contribute to the evolution of their world.

On the higher education scene, it ranks among the top 10 engineering schools in Europe. Its purpose is also to become a centre for research and innovation recognized throughout the world, a partner of choice for business and industry.

INSA ONLINE SPRING SCHOOL

For this 2 weeks Online Spring School, students will tackle the subject of the Internet of Things. While connected devices are all around us and lead the way towards smarter cities, students will discover in this 1st track, how they work and what is at stake, through practical exercises.

Students will experience hands-on innovative and interactive teaching online. Even though they are not travelling, they will acquire valuable international experience, while they work in multi-cultural teams, e-meet INSA students, get to know French culture and participate in intercultural activities online. With this main goal in mind, the INSA Online Spring School will run live for a small group of 20 students.

We are proud of this program, a safe and quality teaching in challenging times. We hope you will enjoy this international and human experience !

COURSE DESCRIPTIONS

Disclaimer

If you have any questions about the Online Spring School program, please do not hesitate to contact:

Noelia NAVARRO – Coordinator for the program – online-spring-school@insa-lyon.fr

TRACK : CONNECTED DEVICES AND SMART DEVICES

Hours and Credits: 20 total contact hours; 2 ECTS

Prerequisites: This is an entry-level course. The only prerequisites are some knowledge and practical experience of computer programming, language and algorithms.

Academic coordinator: Arthur Gatouillat – arthur.gatouillat@piwio.fr

Instructors:

Dr. Arthur Gatouillat arthur.gatouillat@piwio.fr

Dr. Loïc Sevrin, loic.sevrin@piwio.fr

PART I: INTRODUCTION TO THE INTERNET OF THINGS AND HOW IT RELATES TO SMART CITIES

OBJECTIVES AND METHODS

This lecture series provides an overview of the concepts and challenges of the Internet of Things applied to smart cities, and its ever-evolving ability to interconnect people, processes, and data. The course is practical, and case-study based. To enhance learning and retention, this course introduces practical "how-to" guidance, tools and design methods that students can apply immediately through various labs and tutorials. Classes will typically consist of lectures, speakers from both industrial and academic backgrounds, rapid prototyping tools, in-lab exercises, and discussions of case studies.

SYLLABUS

- ❖ Introduction to the Internet of Things:
  - ⇨ What is the IoT?
  - ⇨ What are some of the basic applications?
  - ⇨ What are the broad technical concepts powering the IoT?
  - ⇨ How can the IoT be applied to smart cities?
  - ⇨ *Student work*: Case study of an application of the IoT to the smart cities.

- ❖ Introduction to data collection and processing:
  - ⇨ How is data stored in IoT systems?
  - ⇨ Which tools can be used to process data and gain valuable insights on the physical world?
  - ⇨ What are the main challenges to store and process this data efficiently?

- ❖ Introduction to geographical data storage and processing:
  - ⇨ How is geographical data stored?
  - ⇨ How can geographical data be processed?
  - ⇨ What are the traditional tools and standard to deal with geographical data?
  - ⇨ Technical introduction: Node.js, Javascript, HTTP, HTML and databases.

PART II: GEOGRAPHICAL DATA MANIPULATION LABORATORY

OBJECTIVES

Students will collaborate with classmates on smart cities practical laboratories, in which they will use theoretical and practical knowledge acquired in the Phase I lectures.

SYLLABUS

The laboratory will be structured as follows:

- ❖ Modelization on an intelligent building:
    - ⇨ Simulation of sensors in an intelligent building.
    - ⇨ Remote control of connected sensors and actuators.
    - ⇨ Technologies: Node.js, HTTP, REST, SQL.

- ❖ Processing of geographical data:
    - ⇨ Processing of real-life geographical data.
    - ⇨ Querying and displaying geographical data.
    - ⇨ Technologies: Node.js, REST, GeoJSON, PostGIS.

EVALUATION:

Multiple choice quiz (30% of the grade) related to Part I.

Oral evaluation of the IoT case study (30% of the grade).

Laboratory report evaluation (40% of the grade).

REFERENCES:

Kleppmann, M. (2017). Designing data-intensive applications: The big ideas behind reliable, scalable, and maintainable systems. "O'Reilly Media, Inc.".