
 **Dominante Track :**
Communicating Systems & Internet of Things

Majeure Track :
Intelligent Networks and Systems

Paris-Saclay Campus

Semester 7
Semester 8

Semester 9
Semester 10



Urgency Telecoms
Radio network design & contribution to disaster risk preparedness

Internet of Things
Information theory, Machine learning and Data analytics

Intelligent Transportation Systems
Connected Autonomous Car Modelling


Smart connected cities
Infrastructures and resources

Social Networks

Industry 4.0



Networked systems
5G, Internet of Everything Networks

1

 **Semester 7 - Communicating Systems & Internet of Things**

(ST5) Engineering Challenge Term : Intelligent Communicating Vehicles ²

- **System Modelling ¹**
- **Automatic Control ¹**
- **Intelligent Communicating Vehicles : Contexts and issues ²**
- **Intelligent Communicating Vehicles : Key technologies and architectures ²**
Sensors, Radar, ADAS, Data fusion, V2x communications, System modelling, Simulation platforms
- **Demonstration of autonomous connected cars : Teamwork challenge week ²**
Testbed experiment with miniature autonomous cars equipped with sensors, computing resources and communication capabilities

(SG6) 3 Elective Courses

- **Communication Theory ²**
- **Mobile Networks and Services ²**
- **Architecture and design of digital systems ³ / Machine learning ³ / Humanities ³**

1 Elective course (blocked week)


- **Experimental course – Radio link design ³ / Understanding the blockchain ³ / Humanities ³**

Common courses

- **Entreprise game ¹**
- **Law ¹**
- **Organisation Sociology ¹**
- **Engineering professional skills workshops ¹**
- **Languages**
- **Sports**

¹ Common courses
² Specific track courses
³ Elective courses


2



Semester 8 - Communicating Systems & Internet of Things

Engineering Challenge Term (ST7) : Smart connected cities ²

- **Optimization ¹**
- **Smart cities : contexts and issues ²**
Digital twin, experiments, smart cities use cases
- **Networked systems and smart cities ²**
Smart city networks, Game theory, Ad-hoc networks, Resource allocation optimisation
- **Integrated projects ²**
Network optimisation for Internet of Everything (energy, vehicles, sensors, data...)



Smart connected cities
Infrastructures and resources
optimisation and control

3 Elective Courses (SG8)

- **Object oriented software engineering ³ / Algebra and cryptology ³**
- **Cloud computing and distributed computing ³ / Interactive robotic systems ³ / International economy ³**
- **Artificial Intelligence ³ / Information theory, Big data and learning ³ / Humanities ³**

1 Elective course (blocked week)

- **Experimental course – Optical link design ³ / Humanities ³**

1 project


- **IoT / Autonomous Vehicles / Cubesat ⁴**

Common courses

- **Philosophy ¹**
- **Humanities ¹**
- **Engineering professional skills workshops ¹**
- **Languages**
- **Sports**

¹ Common courses
² Specific track courses
³ Elective courses
⁴ Elective project

3




Majeure Track - Intelligent Networks and Systems

- **Objectives** : This track aims to train high-level engineers with a global view of the problems induced by intelligent systems and networks integrating connectivity and data processing with a specific focus on wireless communications and networks and the mathematical and methodological tools for their design and supervision. These systems connect people, objects, machines, vehicles, robots, energy or processes. The arrival of new technologies constituting **IoT, 5G, social networks, artificial intelligence** will profoundly transforming many sectors of our societies and industries (telecoms, transport, energy, health, factories, cities, civil security, logistics, monitoring, etc.). Industrial partners are involved in curriculum, exposing their vision on issues and exposing practical applications.

Employment : Télécoms (Nokia, Ericsson, Sagemcom, Huawei, Qualcomm, Thales), Aéronautique et spatial (Thales, Airbus, Safran, Dassault), Opérateurs (Orange, Bouygues Telecom, Free, Sigfox, Eutelsat, TDF), Transports (RATP, SNCF, Renault, PSA, Thales), Energie (EDF, ENEDIS, RTE, ENGIE), Numérique (Google, Facebook, Amazon, Microsoft)


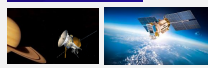
4



Semester 9 - Intelligent Networks and Systems



(SD9) Communicating systems and connected objects
Contexts and issues : panel-dicussions, expert conferences, visits with industrial partners

- Fundamentals in Digital communications & Networks, Electronics & Electromagnetic ¹
- Communications systems
- Embedded systems for real-time applications
- Wireless device architecture
- Environment and legal issues of communicating systems
- IoT integrated project


(SM10) Wireless Communications and Networks
Contexts and issues : Wireless networks challenges and vertical applications (Telecoms, Energy, Transport, Industry 4.0, Health, Monitoring, Urgency, security, Environment, Cities...)

- Estimation, Detection and Learning
- Advanced error control coding
- Multimedia and source coding
- Wireless networks
- Network information theory and applications
- Economic, industry environments and social impacts of networks

¹ Common prerequisite with optional parts


5



Semester 11 - Intelligent Networks and Systems

(SM11) Intelligent networking systems
Expert conferences : The role of Artificial Intelligence (AI) and Machine Learning (ML) in wireless networks and networking systems

- Network science
- Distributed storage and cloud computing
- Reinforcement learning
- Deep Learning
- Game theory ¹
- Optimisation and control ¹
- Virtual and Augmented reality ¹
- Network management and control : new paradigms
- Networking system design



(SM10-11) Industrial project (240 h)

(SM12) Training period (23 weeks)

¹ optional courses

6