TELECOM Paris





A CLOSER LOOK

AT OUR ENGINEERING PROGRAMS

2023 ACADEMIC YEAR





Foster Imagination Ignite Entrepreneurship

télécom paris Success Starts Here

A SCHOOL THAT CULTIVATES EXCELLENCE

AND IS PART OF:

TÉLÉCOM PARIS IS:

> A founding member of the Institut Polytechnique de Paris, a world-class science and technology institute composed of five graduate schools: École Polytechnique, ENSTA Paris, ENSAE Paris, Télécom Paris and Télécom SudParis, with a key partnership with HEC. This internationally-oriented group develops cutting-edge scientific research and offers programs with the highest standards of excellence for all degree levels. It also ensures excellent employability for graduates.

YTECHNIQUE

> An IMT school (Institut Mines-Télécom), 1st group of engineering and management schools dedicated to higher education and research for innovation in France. IMT conducts its activities throughout France at thirteen graduate schools and trains 13,000 engineers, managers and PhDs. IMT has partnerships with the best institutions and companies in France and abroad through alliances and agreements, and two Carnot label institutes.







A COMMUNITY-CENTERED WELCOME

- 875 engineering students
- **432** specialized Master's students
- 226 doctoral students
- 19,000 graduates

AN INTERNATIONAL PERSPECTIVE

- +100 partnerships in 40 countries including:
- 45 dual degrees
- 37 Erasmus programs
- 45% international students
- **1** international campus in Shanghai: Paris Shanghai Jiao Tong (SPEIT)

CUTTING-EDGE RESEARCH

160 research and faculty members and permanent researchers

570 international publications

153 patents filed

25 teaching & research chairs and laboratories with corporate funding



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BUSINESS CREATION

+ **de 500** companies started since 1999, 80% of which are still active

3 start-ups created each month

+ 5,500 jobs created €1.1 billion raised from financial partners since 2015

TOP-RANKED

2nd overall in France (L'Étudiant)

Number 1 for digital tech schools (Le Figaro)

5th best French institution (International Times Higher Education World Rankings)

engineer training at Télécom Paris



Training, projects, and interpersonal internships

2[№] YEAR

A TAILORED APPROACH

Choose 2 out of 14 specialized academic tracks + core curriculum courses

3RD YEAR

PREPARING YOUR CAREER

TECHNOLOGICAL INNOVATION

Choose 1 out of 12 options + Master's Research Innovation Project (PRIM)

MASTER'S-ENGINEER DUAL DEGREE

Master 2 at an Institut Polytechnique de Paris school or at a partner university (dual engineering + Master's degree)

MULTIDISCIPLINARY PARTNERSHIP

Master 2 transversal complementary or a dual degree with partner schools in France

INTERNATIONAL OPTION

International program: Dual degree or Exchange program (e.g. Erasmus)

6-MONTH ENGINEERING INTERNSHIP

EXPERIENCE ABROAD

YOUR 1st YEAR AT TÉLÉCOM PARIS: DISCOVER DIGITAL ENGINEERING

In the first year, our curriculum covers a wide spectrum of subjects, from delving into nanoscopic levels and comprehending the electronic structure of matter to tackling substantial dimensions, which involve addressing economic, social, and environmental challenges linked to the growth of digital technology. The common courses in this year encompass social and ecological transition, team-led elective projects, scientific electives, language studies, and interpersonal development courses. You'll shape your academic focus by exploring the fields of expertise available in the second year.

FOUNDATIONAL INSTRUCTION

Applied Mathematics and Digital Communications

- Analysis
- Probability and statistics
- Digital communications and information theory
- Tools and applications for the signal, images, and sound

Basic Concepts of Physics and Electronics

- Optics and photonics
- Propagation
- Micro- and nanophysics
- Electronics

Computer Science

- From logic gates to operating systems
- Algorithms and computer science fundamentals
- TypeScript for the Web
- Object-oriented programming in Java
- Contributing to open-source software
- Networks

Economic, Social and Human Sciences

- Introduction to contemporary economics
- Introduction to management
- Technology and society
- Practices and analysis of written discourse
- Entrepreneurship and digital innovation

Discovering the Business World

- Gaining insight into the functions and
- responsibilities of digital engineers
- Company visits
- "Discovering Careers in Digital Engineering" lecture series

The Science of Climate Change

- Understanding the scientific mechanisms of climate change
- The central role of energy
- The role of collectives (governments, businesses,

associations) and individuals including citizens, employees, and independent professionals in this transformative process

PROJECTS

Team Project - ARTEFACT

(1/2 day per week throughout the first semester) During the first semester, you will collaborate in groups of 4 or 5 students, with dedicated time slots reserved for a digitalfocused project. The essence of ARTEFACT lies in fostering resourcefulness to design your unique system, nurturing creativity to personalize and optimize its functionality, and acquiring essential technological skills as required.

A customized application project of your choosing

(1/2 day per week throughout the second semester)

This project offers a hands-on, software-based application of the first-year curriculum, integrating a minimum of two technical disciplines. It serves as a guiding experience for students in their Master's program journey, offering a glimpse of the possibilities within the diverse range of available. disciplines.

COMMUNICATION

- Language courses: English + one or two languages from among 10 choices, as a beginner or intermediate learner
- Contemporary Humanities courses
- Interpersonal training (theater, improvisation, etc.).

THE INTERSEMESTER WEEK

A week of scientific elective courses for in-depth exploration of a specific theme or to discover a new field.

THE PERSONAL DEVELOPMENT INTERNSHIP

At the end of your first year, you have the opportunity to embark on a 1-2 month summer internship, providing invaluable realworld experience with a company or organization. The choice is flexible, with the possibility to complete it in France or aborad.

YOUR 2ND YEAR AT TÉLÉCOM PARIS: TAP INTO YOUR EXPERTISE



MASTER 2 SPECIALIZED TRACKS

AND FIELDS OF APPLICATION

By choosing two primary digital domains from a selection of 15 possibilities, you shape a specialized profile that aligns with your interests. These account for more than 50% of your academic journey and are comprehensively examined. Additionally, you will enhance your education with a wide array scientific and technical disciplines, legal and social sciences, as well as the facets of language, culture, and human development. The personal and interpersonal skills honed throughout become valuable assets that contribute to your professional growth and overall fulfillment.

2ND YEAR TRAINING

- Two study pathways (40 ECTS credits) out of 14, some of which offer different options.
- 8 complementary courses (20 ECTS credits) in the economic, human and social sciences.
- Language courses (4 ECTS credits per semester).
- Interpersonal and professional training courses
 (3 ECTS credits per year) from a wide range of choices.

A PROGRAM IN ENGLISH

During your 2nd and 3rd years, you have the option of completing your studies in English. You will complete two specialized tracks selected from among Distributed Software Systems, Random Modeling & Scientific Computing, Data Science, Markets-Organization-Data-Strategy, Applied Algebra and Signal Processing for Artificial Intelligence, complemented by a choice of human and social sciences, all offered in English.

THE 14 SPECIALIZED TRACKS

(see details on the following pages)

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

- Data science
- Signal processing for artificial intelligence
- 📲 Image

MATHEMATICS AND COMPUTER SCIENCE

- Random modeling and scientific computing
- Applied algebra

Q Mathematics, theoretical computer science and operational research

ECONOMY AND DIGITAL INNOVATIONS

Markets-Organization-Data-Strategy

NETWORKS, COMMUNICATIONS AND CYBERSECURITY

- Large digital infrastructure
- Mobile networks and the Internet of Things
- Computer network and infrastructure security
- Telecommunications: data for systems

DIGITAL, INTERACTIVE AND EMBEDDED SYSTEMS

- Embedded systems
- Distributed software systems
- 3D and interactive systems

EXPLORATORY RESEARCH

As part of your 2nd-year, you have the flexibility to substitute one of your courses with a Research Initiation course. Guided by a research topic proposed by a professor at Télécom Paris, you will engage in independent research activities for half a day each week within a laboratory setting. During the first semester, you will learn how to conduct a comprehensive literature review on your chosen subject. In the second semester, you will craft your inaugural research paper, culminating in a presentation to your peers at the year's end.

This course can be continued in the third year with an internal option associated with a Master's Research Innovation Project (half-time for one semester) or by applying for a PhD Track at the Institut Polytechnique de Paris.

DATA SCIENCE (SD)



The Data Science track is taught in English.

Objectives

The Data Science track covers all aspects related to the exploitation, management, and analysis of structured and unstructured data.

In practice

The course combines theoretical and practical components, ensuring a good balance of math seminars and hands-on work in the computer lab. You will increase your knowledge of databases, web development, statistics and statistical learning.

Professions

Career paths include data scientist or analyst, statistical engineer, database administrator, or careers in research and R&D in statistical learning, data management, data extraction, data mining, and learning mathematics.

For those who love

- Applied mathematics
- Delving into cutting-edge subject areas

3rd year technological innovation at the school

- Data science
- Artificial Intelligence

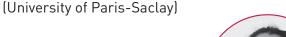
Master's-Engineering Dual Degree

Learning option:

- Mathematics, Vision, Learning
- (IP Paris/Univ. Paris-Saclay)
- Data Science (IP Paris)
- Data and Artificial Intelligence (IP Paris)

Data management option:

- Data and Artificial Intelligence (IP Paris)
- DataScale: Data management in a digital world







Olivia Hennequin, Class of 2022

This track combines computer science and mathematics to teach us how to leverage databases. It features theoretical and practical courses (conducted entirely using Python and SQL), as well as group projects. These projects enable us to apply our knowledge in the subjects of our choice while gaining teamwork experience in a professional environment. In practical terms, the SD track perfectly complements a wide range of other tracks by providing both a general view of data as well as a more technical perspective in terms of data processing and exploitation.

This track plays a key role in numerous research projects and is therefore chosen by the largest group of students.

During the third year, it also offers the opportunity to participate in exchange and dual degree programs around the world. This provides students with a wide range of choices for continuing their studies in France or abroad. This track offers numerous career opportunities in cutting-edge sectors.

Head: Mauro Sozio and Pavlo Mozharovskyi **Head of international mobility:** Stéphan Clémençon **Internship coordination:** Olivier Fercoq et Hicham Janati

SIGNAL PROCESSING FOR

ARTIFICIAL INTELLIGENCE (TSIA)

THE TSIA courses are taught in English.

Objectives

Upon completion of this track, students will have a broad and operational perspective of statistical learning and signal processing. They will understand the issues surrounding data processing and *big data*, the methodological foundations (statistics, optimization) and techniques for processing temporal data in particular (signal processing).

In practice

Students' training prioritizes rigorous lectures and practical work in realistic conditions.

Professions

The track trains future engineers who will have a wide range of skills in the area of statistical learning (*machine learning*) and signal processing, which cover numerous fields of application: music and speech, biosignals, radio astronomy, transmission and compression of multimedia information, etc.

For those who love

- Math applied to practical problems
- Statistical learning
- Signal processing

3rd year technological innovation at the school

- Data science
- Artificial Intelligence

Master's-Engineering Dual Degree

- Automation and Signal and Image Processing (University of Paris-Saclay)

- Data and Artificial Intelligence (IP Paris)
- Data Science (IP Paris)
- Mathematics, Vision, Learning (IP Paris/Univ. Paris-Saclay)
- Acoustics, signal processing and computer science applied to music (Sorbonne University)
- Bio-Imaging (Université Paris-Descartes, Biomedical specification)

Yukun Liu, Class of 2022



TSIA associates the knowledge from broad subjects, and these subjects are all explored step by step. For example, the path of learning for machine learning is from Hilbert spaces to SVM, to perception, along to neural network. And this helps build solid foundations in the expertise. TSIA tightly connects theory with practice. Each course contains two or three lab sessions, and it's always fascinating to learn the theories, implement them and witness their functionality in practical terms (when they work).



Head: Roland Badeau Head of international mobility: Matthieu Labeau Internship coordination: Mathieu Fontaine

IMAGE



For those who love

- Images
- Digital photography
- Mathematics and algorithms
- Automated learning applications

Objectives

This course of study (IMA) ensures solid knowledge in image processing and interpretation, which is valuable in industrial pursuits as well as in research laboratories for those pursuing a PhD.

In practice

This academic track allows students to acquire the fundamentals of image analysis and then discover more advanced courses in mathematical and image techniques, computer vision and 3D reconstruction, approaches inspired by artificial intelligence, particularly deep learning, for image analysis and interpretation, image classification and indexing, and video. The main fields of application (medical imaging, aerial and satellite imaging and consumer photography) are presented by expert researchers in these fields and supplemented by presentations by industrial stakeholders on other applications (biometrics, industrial vision, etc.).

Professions

Students prepare for research engineer positions and research on image processing and interpretation studies, vision and 3D in a wide range of fields including medical and biological imaging, consumer photography, scene modeling and synthesis, spatial and aerial imaging, spatial and aerial imaging, biometrics, defense, etc.

Heads: Yann Gousseau and Florence Tupin **Head of international mobility:** Yann Gousseau and Florence Tupin **Internship coordination:** Michel Roux

3rd-year technological innovation at the school

- Image
- Artificial Intelligence

Master's-Engineering Dual Degree

- Image (Sorbonne Université)
- Mathematics, Vision, Learning (IP Paris/Univ. Paris-Saclay)
- Health Engineering: Bioimaging track (University of Paris-Descartes)
- Automation and Image and Signal Processing Images (University of Paris-Saclay)
- Physical Remote Sensing Methods (Sorbonne University)
- Data and Artificial Intelligence (IP Paris)

Clara Teissier, Class of 2023



I really enjoyed the practical aspects of the IMA track: there are a lot of practical sessions and projects each period to help us apply the image processing methods and case studies presented in class. It works well in combination with more theoretical tracks.

It offers a broad perspective of image processing, both with and without machine learning, and on the different fields of application: medical, satellite imaging, etc.

The projects then enable us to broaden our knowledge and to learn how to conduct our own research into more in-depth methods than those we have seen in class.



RANDOM MODELING

AND SCIENTIFIC COMPUTING (MACS)

MACS courses are taught in English.

Objectives

The MACS track provides training in applied mathematics, specifically in the fields of random modeling and scientific computing for applications (according one's choice) in financial mathematics, data science, modeling and signal and image processing.

In practice

In MACS, we take an in-depth look at mathematical tools for statistics, scientific computing and financial mathematics. The theoretical approach is similar to that of the intensitve "classes préparatoires," with seminars and practical sessions completed in R. The Masters 2 completed thereafter often focuses on probability, finance or statistics.

Professions

Technology companies and the financial industry particularly appreciate dual degrees from this Master's program. This type of program opens vast opportunities for PhD students to pursue an academic thesis or an industrial project (CIFRE thesis).

For those who love

- Probability
- Data analysis
- Mathematics and applications
- (in finance, data science, etc.)



3rd year technological innovation at the School

- Random modeling and scientific computing

Master's-Engineering Dual Degree

- Random modeling, finance and data science (University of Paris-Diderot)
- Probability & Finance (IP Paris)
- Data Science (IP Paris)
- Statistics. Finance and actuarial science (IP Paris)
- Mathematics of randomness (IP Paris)
- Mathematics of randomness (IP Paris)
- Mathematics, Vision, Learning (IP Paris/Univ. Paris-Saclay)

Anna Van Elst, Class of 2023



MACS is an excellent track for those who love probability and theoretical mathematics. It covers all the key probability concepts: mathematical statistics, stochastic calculus, modes of convergence, and martingales.

I especially enjoyed the quality of the demonstrations and the diversity of the mathematical reasoning. In addition, this track helped me understand the tools used in data science and mathematical finance.

The MACS track also paves the way for excellent opportunities in the best applied mathematics Master's programs (Probability & Finance, Mathematics, Vision, Learning-MVA, etc.).



Head: François Roueff Head of international mobility: Pascal Bianchi Internship coordination: Laurent Decreusefond

APPLIED ALGEBRA

Cryptography, quantum information, coding

The ACCQ courses are taught in English.

Objectives

This track offers an introduction to several IT and telecommunication fields including formal calculation, correction coding, cryptography and quantum information theory. This track is primarily based on core mathematical foundations, especially algebraic concepts.

In practice

These areas are first examined from a theoretical perspective. This includes purely mathematical courses (arithmetic, finite fields, algebraic curves) and courses combining computer science and mathematics or even physics (correction coding, cryptography, quantum information). The modules are taught in traditional lesson-seminar form, with around fifteen students per class. Certain modules can also take the form of projects or practical sessions on machines (computational algebra).

Professions

This track opens the door to research, with the most natural next steps being a Master 2 followed by a thesis. However, it could also provide helpful theoretical insight for students who wish to pursue a career as an engineer specializing in communication systems networks or security.

For those who love

- Algebra

- Mathematics in general, and are not afraid of abstraction

3rd-year technological innovation at the school

- Quantum Engineering

Master's-Engineering Dual Degree

Vincent Moreau.

Class of 2021

- Machine Learning, Communications, and Security (IP Paris)

- Algorithmics and Foundations of Programming, formerly Parisian Master of Research in Computer Science (Université Paris-Saclay)



The Applied Algebra (ACCQ) track provides highlevel mathematical training on a wide range of topics, such as cryptography, algebraic geometry and quantum information. Combining the study of basic mathematics with the most recent applications, ACCQ allows students to pursue opportunities in the academic world as well as in prestigious corporate R&D departments.

With less than fifteen students and an excellent faculty members, ACCQ is a flagship Télécom track. It's the ideal choice for those who wish to continue their algebra studies after their entrance exams!



Heads: Aslan Tchamkerten and Filippo Miatto - You can also apply for a PhD Track in Mathematics or Computer Science at the Institut Polytechnique de Paris

Head of international mobility: Michèle Wigger Internship coordination: Ghaya Rekaya

MATHEMATICS, THEORETICAL COMPUTER

SCIENCE AND OPERATIONAL RESEARCH

The *MITRO* course of study is designed for students seeking advanced training focused at the interface between computer science and mathematics. It is especially recommended for those who wish to pursue a PhD in Computer Science.

Objectives

The academic track equips future engineers with the tools they need to analyze and solve difficult mathematical and algorithmic problems using a variety of approaches.

In practice

The program combines classes presenting methods of combinatorial optimization, advanced algorithms, game theory, graph theory or distributed computing with teaching units that provide an understanding of the limits and the ins and outs of programming by means of computability and logic.

Professions

This track trains minds that will be ready to overcome the challenges facing the big names in IT and in every sector (transport, energy, logistics, banks, health telecommunications). It paves the way for career opportunities in research and experts in the corporate world, from innovative start-ups to large companies.

Head: Bertrand Meyer Head of international mobility: Petr Kuznetsov and Jean Leneutre Internship coordination: Bertrand Meyer

For those who love

- Solving mathematical problems
- with original approaches
- Understanding the possibilities and limits

of computer science

3rd-year technological innovation at the school

- Quantum Engineering

Master's-Engineering Dual Degree

- Algorithmics and Foundations of Programming, formerly Parisian Master of Research in Computer Science (University of Paris-Saclay)

- Operational Research (University of Paris-Saclay)

Paul Vezia, Class of 2022



All those who love mathematics and theoretical computer science will be fascinated by the various courses taught in the MITRO track.

From game theory to the complexity of the algorithms, the various courses in this track are very different from each other, and yet complementary. MITRO is a perfect match for students who enjoy reflecting on and solving complex problems, since the exercises in the different courses are similar to puzzle-solving.

There are generally around twenty people enrolled in this track, which results in a close-knit class with a sense of solidarity and special connections with the various professors.

Students gain recognized skills that will allow them to continue their studies in theoretical research, but they can also be applied to the business world. The professors, recognized experts in their fields, are available to help students and are skilled teachers.



MARKETS, ORGANIZATION

DATA, STRATEGY



The Economy option in MODS is taught in English.

Objectives

The MODS course of study helps students understand how markets and corporate strategies work and the impacts of digital technology and sustainable development on the organization of companies and digital platforms, business models and corporate information systems and innovations. It also introduces them to the qualitative and quantitative tools used in the Social and Economic Sciences.

In practice

The MODS academic track offers multidisciplinary and complementary courses (Management, Economics, Law/Ethics, Sociology) that provide a broad understanding of the issues involved in the modern digital transformation.

It aims to train engineers who will be able to transform society and innovate by creating business models that take into account new environmental and social approaches as well as ethics.

These courses will increase your theoretical knowledge while also putting it into practice through business cases, mini projects in class, and projects with companies, start-ups, organizations and outside experts.

Professions

Strategic or IT consulting, marketing, finance or technological product and service development.

Head: Myriam Davidovici Head of international mobility: Lukasz Grzybowski Internship coordination: Dana Diminescu

For those who love

- Understanding recent issues related to

responsible and sustainable digital transformation

- Discovering socio-economic methods for data analysis

3rd year technological innovation at the School

- Management, Innovation, Digital option (with Sciences Po)

Master's-Engineering Dual Degree

- Network Industries and Digital Economy (IP Paris)

- Design Innovation Project (IP Paris)

- COSI (Consulting in Organization, Strategy and Systems)

International option

- Master of Science in Management and Technology, Master of Science in Economics (LSE, Berkeley, Columbia, MIT)

> Paul Frambot, Class of 2022



The MODS track offers courses on responsible digital transformation and introduces us to digital management projects while keeping social, ethical and environmental factors in mind.

We directly apply the concepts learned in class through very interesting corporate projects.

For example, we worked in a group of three with Air France for six months to develop 5G applications for the Paris-Charles de Gaulle airport. I also worked on the socioeconomic issues affecting the CityTaps startup, which develops connected water meters in Africa. We learned a great deal about the organization and strategies of start-ups and large companies.



LARGE DIGITAL

INFRASTRUCTURE (GIN)

Objectives

The GIN track provides students with a comprehensive picture of the stakeholders, architecture, and technology involved in large digital infrastructure. This track seamlessly integrates various components (cloud, fixed and mobile networks, security), that can each be pursued through specialized courses.

In practice

The GIN track is designed to give students an overview of the various stakeholders involved in large digital infrastructure, their interactions and underlying technologies including content distribution (video and web), cloud service providers, internet service providers and operators, campus/ corporate networks, access networks (fixed and mobile, IoT) and final users. The approach is both technical, integrating architecture and protocol aspects, and techno-economic (issues, interactions between the stakeholders and friction points). Security issues are also addressed. The goal is not only to understand current and future technology, but also to understand the reasons behind these changes.

Professions

This course of study opens the door to a wide range of opportunities, given the important role of large digital infrastructures in our economy and society. A variety of companies are involved: start-ups, specialized small and medium-sized companies (e.g. content distribution, specialized software publishers), large national groups ("sovereign" networks and cloud) and international groups

Head and international mobility and Internship coordination: Jean-Louis Rougier

For those who love



- Understanding the various stakeholders involved in large digital infrastructures and their interactions

- Understanding the technologies used and their development

(equipment manufacturers and service providers). Possible careers include:

- Pre-sales architect and engineer
- Consultant (ESN, integrators)
- Customer manager (operators, service providers)
- Project manager/Product manager
- Research engineer (builders, service providers)
- PhD (academic laboratory or industrial)
- Business creation (start-up, etc.)

3rd-year technological innovation at the school

- Large digital infrastructures
- Computer network and infrastructure security

Master's-Engineering Dual Degree

- Optic Networks Photonic Systems (IP Paris)
- CSN Computer Science for Network (IP Paris)





This track provided me with an excellent balance between theory and practice. But above all, it gave me an overview of how digital exchanges work. This is a brand new track and the professors are really attentive to what we would like to see and how we would like to work.



MOBILE NETWORKS

AND THE INTERNET OF THINGS (RIO)



The RIO track offers advanced training on mobile networks and the Internet of Things. While cellular networks completely changed our modes of communication, the Internet of Things (IoT) is expected to revolutionize health, industry, transport, cities and leisure activities. Mobile networks and IoT are therefore the two key components of the future fifth generation.

Objectives

The track therefore aims to train engineers with an excellent knowledge of existing technology and the capacity to design networks of the future.

In practice

This coure of study offers a good balance between the general principles of wireless networks, technological aspects (standards, protocols, architecture, including for mobile cloud), platform tests, theoretical aspects (stochastic modeling for performance assessment and optimization) and a look at the current challenges.

Professions

The RIO track is designed to train consultants, network architects, design engineers employed by operators, as well as by energy suppliers, intelligent car manufacturers, and in the e-health sector. Students also have the possibility of working for start-ups in the Internet of Things or to pursue research or teaching activities.

Head: Anaïs Vergne Head of international mobility: Marceau Coupechoux Internship coordination: Sawsan Al Zahr

For those who love

- Discovering the world of the Internet of Things
- Understanding how our smartphones communicate
- Understanding the issues pertaining to IoT operators and stakeholders
 - _____

3rd-year technological innovation at the school

- Large Digital Infrastructures

Master's-Engineering Dual Degree

- Optic Networks Photonic Systems (IP Paris)
- Computer Science for Network (IP Paris)
- Radio Systems (SyR), Mention E3A Electronics, Electrical Energy

Innimei Tiroumalechetty, Class of 2022



The RIO track focuses on three themes: mobile networks, the Internet of Things and the mobile cloud. We study the various wireless technologies in depth, from their historical development to the way they currently operate. The track is designed to allow us to build a solid knowledge base between gradually advancing towards modern applications. For example, we start by studying a 2G network and end with a 5G network and tools that enable the configuration and optimization of a wireless network.

We have practical sessions and/or projects on each theme that allow us to put our knowledge into practice. For the mobile network component, we primarily perform analyses on radio frames. We also complete a group project on an IoT application. We then complete practical virtualization work and analyze scientific articles that provide a better understanding of the significance of cloud technology.



COMPUTER NETWORK AND

INFRASTRUCTURE SECURITY (SR2I)

For those who love

- Evaluating a system and changing its use
- All aspects of cybersecurity
- Cryptographic challenges
- Networks of the future and critical infrastructure
- Electronic payment and embedded systems

Objectives

The SR2I track trains engineers to become highly qualified in Cybersecurity, with a mastery of the technical, organizational and legal aspects involved in computer infrastructure and networks throughout their various transformations in order to manage the associated risks.

In practice

This course of study includes:

- mastering the various security services and their cryptographic mechanisms;
- knowing how to assess risks, threats and consequences;
- mastering the analysis and implementation of attacks;
- mastering analysis and audit tools;
- mastering techniques for developing secure applications and protocols;
- implementing trusted infrastructure.

Students are offered theoretical instruction consolidated by practical training in a variety of forms (workshops, practical sessions, group projects, individual projects) allows them to master the concepts and tools.

Professions

The SR2I trains engineers in communication systems, networks and security.

3rd year technological innovation at the School

Computer network and infrastructure security



8

Bastien Morantin, Class of 2023



For my second year of engineering school, I chose the SR2I track because it trains us to respond to new security issues in the digital world. Security has become crucial to all of our computer systems, and in this track we learn about the key parts of a secure system, and how to analyze and improve them.

In class, we address various aspects of security and study a wide range technical solutions, thanks in particular to projects and practical exercises. I have always been fascinated by computer science and I therefore selected the Embedded Systems (SE) track The two are perfectly complementary, which enable me to work on a project in its entirety as I take on future endeavors.



Head, Head of international mobility: Rida Khatoun Internship coordination: Pascal Urien

TELECOMMUNICATIONS:

DATA FOR SYSTEMS

Objectives

This academic track provides both a comprehensive and global view of communication network technology, from both a theoretical and practical perspective.

In practice

One of the strengths of this course of study is the main project, which creates a central theme that follows students throughout the year, helping them better understand the concept of communication systems by making connections between the different Teaching Units.

More specifically, students study digital communications, optical communications, antennas and the associated wireless electronic communication systems and their interactions in order to gain a start-to-finish view of a communication network.

Professions

Upon completing this track, you will have a comprehensive and multidisciplinary view of communication systems. The 3rd year will allow you to further explore one of the areas presented.

You will then be prepared to join a major company, SME or an innovative start-up from a wide range of sectors, from telecoms to aeronautics, or even automotive and health industries. Your training will also be of interest to technology consultancy firms. It is also possible to do an industrial or academic thesis.

For those who love

- Understanding the architecture of a
- communication system
- Understanding how data is transfered
- Understanding how a laser or antenna works

3rd-year technological innovation at the school

- Integration circuits systems and communicating objects

Master's-Engineering Dual Degree

from Institut Polytechnique de Paris

- Integration Circuits Systems

Joe Ing Lee,

Class of 2022

- Optic Networks Photonic Systems
- Radio Systems



After my first year, which allowed me to discover the wide range of fields involved in digital technology, I chose to specialize in telecommunications, which is, of course, a subject that this school truly masters.

Despite being a specialized track, a variety of topics are studied, from wave propagation to quantum optics and communication theory.

Students acquire a firm theoretical knowledge base throughout the year, but the practical focus remains key. The track features a project that connects all the topics and allows students to understand the real applications and practical challenges.



Head, Internship coordination: Anne-Claire Lepage Head of international mobility: Michèle Wigger

EMBEDDED SYSTEMS (SE)

For those who love

- Understanding interactions between

hardware and software without leaving any gray areas

- Both practical and theoretical learning



This track trains engineers with in-depth theoretical and practical knowledge in the area of embedded systems.

In practice

The theoretical instruction is complemented and further explored through numerous practical activities and projects. The topics discussed cover a wide range, from hardware (hardware description languages, reconfigurable architectures, runtime support) to the software aspects (programming a microprocessor system, compilation, concurrent computing) and also include modeling.

Professions

It offers career opportunities in a wide range of industrial sectors including transport, telecommunications, space, nuclear energy, robotics, defense, consumer electronics, etc.

This track also prepares students for several Master's programs.



The SE track was the ideal choice for me. It is the perfect track for those who want to fully understand the internal operations of digital systems, from a computer program written in C or in Rust to the architecture of a processor that runs it, to the design of electronic circuits on FPGA. All of the concepts presented in class are immediately applied through practical workshops and projects.

This track requires investment, but the team of faculty is also very committed to helping students and are always available to answer our questions. The SE class sizes are small, which allows us to help each other more easily.

Head: Samuel Tardieu Head of international mobility: Maria Mushtaq Internship coordination: Tarik Graba

3rd-year technological innovation at the school

- Embedded systems

Master's-Engineering Dual Degree

- Integration Circuits Systems (IP Paris)
- Embedded Systems and Information Processing (IP Paris)
- Distributed Systems and Applications (Sorbonne University)

- Distributed Systems and Applications, Computer Science major (Sorbonne University)

Sami Tendjaoui, Class of 2023





DISTRIBUTED SOFTWARE SYSTEMS (SLR)

For those who love

- Designing computer systems
- Perceiving trends in current systems
- Implementation through practical work



Distributed Software Systems courses are taught in English.

Objectives

The track offers an overview of theoretical foundations, structural models, solutions, practices and methods used by the architects and designer-developers of software and distributed systems. The goal is to help students acquire practical knowledge that will allow them to better understand in-house engineering.

In practice

The issues addressed range from distribution to design, verification and validation, development life cycle and are supplemented with new fields of application.

Professions

The SLR track aims to train specialists in computer science thanks to their skills in three key areas: advanced technologies in distributed systems, new development and deployment methods for software solutions, and business processes.

Professions include:

- Architect or urban planner for distributed systems,
- Software engineer development of systems and services,
- Integration engineer,
- Consultant,
- Project manager.

3rd-year technological innovation at the school

- Advanced distributed software systems

Heads: Petr Kuznetsov and Rémi Sharrock Head of international mobility, Internship coordination: Petr Kuznetsov

Master's-Engineering Dual Degree

- Distributed and Parallel Systems (IP Paris)

-Algorithms and Foundations of Programming, formerly known as the Parisian Master of Research in Computer Science (Université Paris-Saclay)

- M2 Computer Science in Complex Systems (COMASIC), computer science track (Université Paris Saclay)

- Research-oriented Master's in Distributed and Parallel Systems (PDS) at Institut Polytechnique Paris

- Distributed Systems and Applications, computer science program (Sorbonne University)

- Parisian Master of Research in Computer Science (MPRI/AFP), computer science master's program (Université Paris-Diderot, ENS Ulm, Université Paris Saclay, and Institut Polytechnique Paris)

Adrien Boitreaud, Class of 2023



The SLR track provides an understanding of how current large computer systems work.

It offers a good balance of theory and practice. The theoretical aspect addresses distributed algorithms, including the foundations of blockchain and the development of software testing methods.

For the practical components, several projects are spread throughout the year to help students gain experience in Java by deploying systems integrating several machines or threads for distributed computing, for example.

In short, this track is ideal for those who wish to continue to code during their second year and discover computer concepts used in large-scale applications.



3D AND INTERACTIVE SYSTEMS

For those who love

- 3D design and virtual reality
- Interactive devices and systems
- Tactile, mobile and gesture interfaces
- Video games and special effects



Objectives

This track aims to provide students with comprehensive training in the areas of humanmachine interaction and 3D computer graphics. It prepares students to become engineers working on the design of advanced interactive systems by offering them the foundations they need in computer science and mathematics in order to complete the digital monitoring of these systems.

In practice

Students learn how to develop interactive 2D and 3D applications for mobile tools and the web. They also gain hands-on experience with 3D computer graphics and virtual reality and develop the project of their choice while attending dedicated seminars.

Professions

Career opportunities for this track include: computer-aided design (CAD), video games, special effects, mobile applications, simulation, interaction design, virtual reality and visualization. This track prepares students for scientific professions related to research and human-machine interactions (HMI) or in 3D computer graphics, with the possibility of going on to complete a specialized Master's degree in one of these two fields.

Heads and international mobility: Eric Lecolinet and Kiwon Um Head of international mobility: James Eagan

3rd-year technological innovation at the school

- 3D and interactive systems

Master's-Engineering Dual Degree

- Image (Sorbonne University)
- Interaction, Graphics & Design (IP)
- Mathematics, Vision, Learning (IP Paris/Univ. Paris-Saclay)



I believe that this track covers a wider range of courses than the others; from HTML for web development to HMI design, to 3D graphic design and visualization, there is truly something for everyone.

All these areas have one point in common: the role of creative freedom and visual arts, which is what made me choose this track.

The variety of practical activities and projects also offers a very stimulating and satisfying aspect because they allow us to obtain the finished product of something we chose and designed ourselves (design of an interactive restaurant terminal, modeling of erosion in 3D, or an interactive presentation tool). This allows us to learn more than we would in a purely theoretical class!



EXPLORING HUMANITIES, LAW, ECONOMICS, SOCIAL SCIENCES,

ECOLOGICAL TRANSITION, LANGUAGES, AND TECHNOLOGIES.

Because a Télécom Paris engineer must understand how digital technology is transforming economies and societies, you will receive training in economics, law, sociology of digital technology, contemporary humanities, and management.

Therefore, you are required to take a course (known as a UE) in economics and management, infocom, design, and sociology, a course in contemporary humanities, law, and entrepreneurship. You can supplement your education with elective courses in science and technology.

INTERPERSONAL TRAINING

- Cultivating interpersonal intelligence
- Creative CV
- Drawing life
- Dialogue of diversities
- Creative writing
- Elements of Japanese martial arts for physical balance, communication, and conflict management (SEIKAKO)
- Social engagement for education
- English theater
- Oral expression
- Building self-confidence and trust with others
- Humor in the workplace relationship
- Societal impact and equal opportunities: Acting for the world of tomorrow
- Introduction to science fiction literature and creative writing workshop on the theme of the future
- Collective intelligence and U theory
- Emotional intelligence: Tools for understanding the world
- The human voice and its challenges
- Activism in the digital age
- The eloquence circle
- The pitch: A human experience
- Leadership for non-Francophones
- Feminine management through television series
- Managing like a conductor
- Managing and working in teams
- Managing communication in an international context
- Leading a discussion towards agreement
- Staging the future
- Getting to know oneself better to become
- an actor in one's future
- Public speaking
- Student project: Societal impact and equal opportunities
- Leveraging your international profile for non-Francophones
- Digital solidarity
- Franco-German tandem
- Improvisational theater
- French theater
- Debating FDA Tournament
- Working in a team within an association
- Time for oneself: Sophrology
- Valuing student association involvement

LAW

- Comparative International Law
- Information and Communication Technology Law
- Labor Law

CONTEMPORARY HUMANITIES

- Approaches to Modern and Contemporary Art
- Understanding Architecture Today
- Design and Information: A History of Connections
- Contemporary Political Issues
- History of Invention in Music
- History and Practices of Documentary Cinema
- People, Technologies, Societies: Anthropological and Visual
- Approaches
- Humanities
- Introduction to Psychoanalysis
- The Anthropocene Object
- Philosophy of Science Today
- The Political Body: Citizenship, Body Techniques, and Biopolitics
- Visual Writings of History
- The Mysteries of Classical Music
- Anthropology Facing Contemporary Questions
- Questions in Philosophy
- Sociology of Humanitarianism
- General Sociology

SOCIAL SCIENCES AND HUMANITIES

- Business Economics for Strategy and Innovation
- Cinema, Society, and Management
- Digital Management
- Digital Economics
- Entrepreneurship and Digital Innovation
- Corporate Finance
- Cultural Industries in the Digital Age: From Creation to Usage
- Responsible Innovation: Green IT, Eco-design, and Other Applications
- Interaction Design: Prototyping
- Interaction Design: User Research
- Social Interactions, Technologies, and Usages
- Internet and Society
- Introduction to Management
- Sociology of Digital Technology
- Contemporary Sociology of Digital Technology

SCIENCES AND TECHNOLOGIES

- Databases
- Foundations of Machine Learning
- Building Responsible and Inclusive Digital Technology
- Technological Innovation
- Machine Learning
- Optimization
- Programming Paradigms
- Programming Competition Preparation
- Statistics
- Creating an Environment for Responsible Innovation
- Web Development

SOCIAL AND ECOLOGICAL TRANSITION

- Building Responsible and Inclusive Digital Technology
- Creating an Environment for Responsible Innovation
- Responsible Innovation: Green IT, Eco-design, and Other Applications



The around forty nationalities represented at the school reflect a cultural and linguistic diversity that the Languages and Cultures department leverages to design its courses. We offer a diversified range of courses that are oriented towards both academic and professional goals, intercultural exchanges, and societal challenges.

INTERCULTURAL, LINGUISTIC, AND COMMUNICATION TRAINING

- General courses based on CEFR levels:
- German, English, Spanish, French as a Foreign and Second Language, Arabic, Chinese, Italian, Japanese, French Sign Language, Russian, Spanish
- Themed courses and projects
- Bilingual courses
- Integration activities for international students in collaboration with the International Relations Department and the Student Union (BDE)
- Intercultural training in collaboration with other
- departments of the school
- Support for external certification
- Internal and external collaboration with partner institutions
- Application support for dual-degrees and jobs abroad

THEMED COURSES

- Advanced Debating Techniques
- Advanced English Grammar
- Advanced Public Speaking and Soft Skills Training
- The Art of British Humor
- Behind the Series (US)
- Conflict Management
- Contemporary Spanish Cinema: Individual Project
- Creative Writing
- Detective Mysteries
- Hip-Hop / Jazz
- The Hobbit
- Internet Cultures
- Latin American Civilizations: Individual Project
- Professional Communication
- Promotional Skills for the Sciences
- Public Speaking Step-By-Step
- The Science of Mindfulness and Well-being
- Socio-Linguististics
- Technology and Ethics
- Treasure Hunting
- The Wire
- US Cinema / US Economy / US Humor / American West



LANGUAGES

- German
- English
- Arabic
- Chinese
- Spanish
- French as a Foreign Language and Second Language
- Italian
- Russian
- Japanese
- French Sign Language

THE IP PARIS ELEVATE CENTER

Excellence in Language, Eloquence, and Verbal Advancement for Technical Endeavors

- CV writing workshops and proofreading services
- Statements of Purpose and Personal Statement support
- Scientific communication services (written and spoken)
- 3-minute thesis competition (3MT)

YOUR 3RD YEAR AT TÉLÉCOM PARIS: EXPERIENCE MATTERS

As 3rd students at Télécom Paris, you are about to dive into the heart of action. This year is nothing short of extraordinary, consisting of six months of intensive courses and six months of immersion as an engineer on an internship. You have the opportunity to choose from a range of exciting options to shape your professional path.

TECHNOLOGICAL INNOVATION

In keeping with their 2nd year path, students can take the "in-house" Technological Innovation option at Télécom Paris for one semester. In addition to the teaching included in this option, they complete a Master's Research Innovation Project: a true learning experience in innovation, taking on challenges from the corporate world or research labs.

MASTER'S-ENGINEERING DUAL DEGREE

Students may choose to complete a Master's degree offered by many partner universities. This allows them to earn the Télécom Paris dual degree and a Master's degree from the partner university.

INTO THE FUTURE

MULTIDISCIPLINARY PARTNERSHIP

This option offers complementary training that breaks with the traditional second-year program. Students may choose a complementary program at the school or opt for a dual degree from one of the Télécom Paris partner universities, such as HEC, Sciences Po, ENSAE Paris, or ENS Lyon.

INTERNATIONAL OPTION

The international option takes the form of an Erasmus-funded stay or a dual degree program. In this case, students earn the Télécom Paris dual degree and a Master's degree from the partner university.

TECHNOLOGICAL INNOVATION AT TÉLÉCOM PARIS



The in-house option continues on from the 2nd year studies. You can choose one of 12 options by taking 120 course hours. These courses are complemented by a Master's Research Innovation Project, which is completed during the semester on a part-time basis.

THE 12 OPTIONS FOR 3RD YEAR STUDENTS

- > 3D and Interactive Systems
- > Image
- Integration of Circuits, Systems, and Communicating Objects
- Artificial Intelligence in partnership with ENSTA Paris
- Management, Innovation, and Digital Technology in partnership with SciencesPo
- Random Modeling and Scientific Computing
- > Quantum Engineering
- Large Digital Infrastructures, Networks, and Internet of Things
- > Data Science
- > Embedded Systems
- > Network and Information Infrastructure Security
- > Advanced Distributed Software Systems

MASTER'S RESEARCH INNOVATION PROJECT (PRIM)

The PRIM is an innovation training program. You will complete this project independently over the course of one semester.

This experience will immerse you in hands-on projects presented by our partner companies and the school's research laboratories, focusing on cuttingedge innovation challenges. Additionally, you have the opportunity to pursue a subject you've already begun exploring, delving deeper into it, or propose an entrepreneurial venture, under the guidance of Professor Thomas Houy, an expert in management.

This project is also enriched by complementary training on key innovation skills. The goal is to be prepared to pursue research, innovation, and entrepreneurship in a digital world.

A few recent PRIM examples:

- **E. Orisni** Graph compression by clique overlap
- H.Braun Aggregating and finding common structure between k strings
- A. Delaunay Matching products in images using AI techniques
- L. de Freitas Smaira Automatic feature creation and its impacts on predictions
- C. Rydhal Setting up a mobile app and launching the marketing

MULTIDISCIPLINARY

PARTNERSHIPS



Multidisciplinary partnerships are available regardless of the track completed during your 2nd year. There are specific prerequisites for each option.

A DUAL DEGREE FROM A FRENCH GRADUATE SCHOOL

> Télécom Paris students may apply to **HEC Paris** to earn the Grande École degree from HEC Paris and the Engineering degree from Télécom Paris (in two years).

> The dual degree from **ENSAE Paris** provides a two-year program in actuarial science, data science, finance and risk management, markets and companies.

> **IFP School** offers a two-year program on energy to meet industry needs and societal expectations in terms of sustainable development and innovation in technical, industrial, economic and financial aspects.

> The dual degree from **ENS Lyon** offers a two-year research and teaching program.

After earning your degree, you may apply to **Corps des Mines** or the **Corps de l'Armement**.



AN OPTION FROM ONE OF OUR OUTSTANDING PARTNERS

> 3rd year at an **Institut Mines-Télécom school**.

> 3rd year at one of the schools in the **ParisTech** network (École des Ponts ParisTech, AgroParisTech, etc.)

> Management, Innovation, Digital option in partnership with Sciences Po

This Master's degree aims to develop innovation in all corporate professions through cross-disciplinary and complementary functions developed at each of our schools.

"Digital for Health" program with Institut Mines-Télécom and the University of Montpellier 2

This program trains research and development engineers who master new technologies used in aspects of health professions.

> "Design-Innovation-Project" Master's program (PIC) with X, HEC Paris, Mines ParisTech and Université Paris-Dauphine

A degree program focused on project management in the business world. This Master's program trains experts in the implementation and coordination of corporate innovation processes.

"Network Industries and Digital Economy" Master's program (IREN) with X, CentraleSupelec, Université Paris-Dauphine and Université Paris-Saclay This Master's program allows students to master the operating principles of network industries and the digital economy and gain the analysis skills and methodology needed to monitor rapidly changing phenomena.

MASTER'S PROGRAMS

DUAL-DEGREES

Télécom Paris works closely with other engineering schools and universities to design training programs and Master's degrees.

These Master's degrees are recommended by Télécom Paris professors as a 3rd year specialization option, just like certain in-house options.

2nd year students in the engineering program can apply to the Master's degrees listed on the right. In the Master's program, admission is granted directly in the second year, with the opportunity to earn a dual degree.

Institut Polytechnique de Paris also offers Master's programs, including 7 run by Télécom Paris:

> Integration, Circuits & Systems (ICS)

> Information Processing: Machine Learning,

Communications and Security (MICAS)

 > Embedded Systems and Information Processing (SETI)

- > Data & Artificial Intelligence
- > Interaction, Graphics & Design (IGD)
- > Mathematics, Vision, Learning (MVA)
- > Design Research

All programs offered by Institut Polytechnique de Paris are available on www.ip-paris.fr



Master's in Design (co-accreditation with Univ. Paris-Saclay): M2 Design Research

Master's in Electronics, Electric Energy, Automation (co-accreditation with Univ. Paris-Saclay): M2 ICS Integration, Circuits & Systems M2 MICAS Machine, Learning, Communications and Security M2 MN Multimedia Networking M2 ROSP Optic Networks & Photonic Systems M2 SETI Embedded Systems & Information Processing M2 Radio Systems M2 TRIED Information Processing & Data Exploitation PhD Track in Electrical Engineering for Communications & Information Processing

Master's in Computer Science:

M2 CPS Cyber Physical Systems M2 CSN Computer Science for Networks M1 & M2 Cyber Cybersecurity M2 Data AI Data & Artificial Intelligence M2 MPRI Foundations of Computer Science M2 HPDA High Performance Data Analytics M2 IGD Interaction, Graphics & Design M2 MPRO Operation Research M2 PDS Parallel & Distributed Systems PhD Track in Computer Science

Masters in Innovation, Business & Society:

M2 IREN - Network industries and Digital Economy

M2 PIC - Design Innovation Project M2 COSI - Organizational, Strategic and Information System Consulting PhD Track in Innovation Industry & Society

Master's in Mathematics and Applications (coaccreditation with Univ. Paris-Saclay): M2 MdA - Mathematics of Randomness M2 MVA - Mathematics, Vision, Learning

M2 Optimization

PhD Track in Mathematics Jacques Hadamard

Master's in Applied Mathematics, Statistics:

- M2 Data Science
- M2 Mathematical Modeling
- M2 Statistics, Finance and Actuarial Science
- M2 Probability & Finance

PhD track in Dáta Science and Artificial Intelligence

INTERNATIONAL HORIZONS

Participating in the Foreign Training Program (FAE) offers a distinctive opportunity to broaden your horizons and receive outstanding training. Télécom Paris offers its students more than 100 partnerships in 40 countries on four continents.

International training is open to our students from French universities or who have been admitted to the first year through entrance exams.

The Training Abroad Program (FAE) can be either a degree program (Dual Degree, Master of Science) or a non-degree program (Erasmus program, in particular).

A dual degree completed abroad can last 12, 18 or 24 months. An engineering internship may be completed during this dual degree program in the host country or upon returning to France at the end of the academic program.





INTERNATIONAL MOBILITY AT TÉLÉCOM PARIS

As part of their studies, Télécom Paris students are required to undertake a study-abroad period. To maximize the benefits of this enriching experience, students typically embark on a onesemester journey.

This international endeavor can be carried out in many ways.

Non-degree study period:

- One or two semesters in the 2nd or 3rd year;
- Short stays: ATHENS weeks, summer schools.

Diploma study period:

- Between 2 and 3 semesters in a double degree or Master of Science program;
- + 1 semester of an engineering internship.

Engineering internship:

• Six months in the third year.

Intermediate internship:

• July-September (between the 2nd and 3rd years).

MOBILITY: A FEW RECENT EXAMPLES

Dual degrees with:

- Polytechnique de Montréal, Canada.
- National University of Singapore, Singapore.
- Technical University of Munich, Germany.

• Royal Institute of Technology in Stockholm, Sweden.

• Semester exchange with Aalto University, Finland.

• One-semester exchange with Universidad Politécnica de Madrid, Spain.

• Master of Science in Artificial Intelligence and Machine Learning at Imperial College, London, UK.

• Master of Science in Computer Science at the Swiss Federal Institute of Technology Zurich, Switzerland.

TÉLÉCOM PARIS,

LOCATED ON THE INSTITUT POLYTECHNIQUE DE PARIS CAMPUS



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