



Catalogue of English-taught courses

at Faculty of Sciences, Université Paris-Saclay

université
PARIS-SACLAY

FACULTÉ
DES SCIENCES
D'ORSAY

December 2020

www.universite-paris-saclay.fr
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About Université Paris-Saclay

Université Paris-Saclay includes ten faculties, four Grandes Ecoles, the Institut des Hautes Etudes Scientifiques, two member-associated universities and shared laboratories with the main national French research organisations.

With **48,000 students, 8,100 academic-research staff and 8,500 technical and administrative staff**, it provides a complete and varied programme of courses ranging from undergraduate degrees to Doctoral programmes, recognised for their quality thanks to the reputation and commitment of its teaching staff.

Located in the **south of Paris**, on a vast site (from Paris to Orsay, including Évry and Versailles), Université Paris-Saclay benefits from a strategic geographical and socio-economic position that is strengthened by its international visibility.

A cutting-edge university, with particular strengths in the sciences and highly recognized in **mathematics** and **physics**, as well as in biological and medical sciences, agriculture, engineering and social and human sciences, Université Paris-Saclay operates in a designated natural area, near Paris and at the heart of a dynamic economic structure.



Université Paris-Saclay

Faculties and Institutions



Associate-Member Universities



National Research Organisations



Faculté des sciences d' Orsay

The Orsay research center was created by Nobel prizes Irène and Frédéric Joliot-Curie the discoverers of artificial radioactivity. Irène was the daughter of Marie and Pierre Curie. In 1955, the premises of the research center inside Paris had become too small to accommodate the large facilities such as particle accelerators essential to modern physics. They decided that the new laboratories, in the fields of nuclear and particle physics, should be settled in the park of the Orsay castle that was recently donated to the Paris University. Today, Orsay has become one of the top campuses in France, if not the first, for Physics and Mathematics. In the seventies, new top-level laboratories and Institutes in chemistry, biology, computer science and earth sciences, settled in Orsay that became the largest scientific campus in France.

The Orsay Faculty of Sciences is the oldest campus of Université Paris-Saclay. It brings together over **10,200 students, 1,600 PhD students, 1,600 professors and 1,800 administrative and technical staff**. Its research laboratories work in close connection with **CNRS** (National Center for Scientific Research), **CEA** (Alternative Energies and Atomic Energy Commission), **l'INSERM** (French Institute of Health and Medical Research), **l'INRAE** (National Institute of Agricultural, Food and Environment Research), **l'INRIA** (French Institute for Research in Computer Sciences and Automation), and **Institut Curie** (medical, biological and biophysical research institute).

The Faculty of Science consists of 7 departments:

- **Biology**
- **Chemistry**
- **Computer Science**
- **Earth science**
- **History of Sciences**
- **Mathematics**
- **Physics**



Faculty of Science Dean's building

Faculty of Sciences- Departmental Contacts

DEPARTMENT	COORDINATOR	E-MAIL	TELEPHONE +33
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Chemistry	Dr. Philippe Berdagué	philippe.berdague@universite-paris-saclay.fr	1 69 15 47 69
Computer Science	Dr. Dominique Quadri	dominique.quadri@universite-paris-saclay.fr	1 69 15 66 27
Earth and Universe Sciences	Dr. Hermann Zeyen	hermann.zeyen@universite-paris-saclay.fr	1 69 15 49 09
Mathematics	Dr. Filipa Caetano	filipa.caetano@universite-paris-saclay.fr	1 69 15 60 32
Physics	Dr. Mathieu Langer	international-physics.sciences@universite-paris-saclay.fr	1 69 85 85 78

Biology

The Department of Biology includes all the research and teaching activities in biology of the Faculty of Sciences of Orsay

The department of Biology organizes research and teaching around five major axes:

- **Macromolecules and cellular functions,**
- **Biology of micro-organisms**
- **Cellular biology development and evolution**
- **Plant physiology**
- **Biodiversity and ecology.**

In addition, there are two cross-cutting themes, neurosciences, as well as systems biology and physical-chemistry-biology interfaces. This includes, inter alia, environmental issues, which are, in essence, multidisciplinary

Key numbers

350 full time researchers

236 teacher-researchers

120 doctoral and post-doctoral researchers working in 12 mixed research units (UMR) associated with the CNRS (Scientific Research National Center), INSERM (Institute for Medical research) or CEA

500 administrative, technical, social and health staff.



Mobility coordinator: Dr. Catherine DREUX
catherine.dreux@universite-paris-saclay.fr

M1 LIFE SCIENCES AND HEALTH International Track France

Director: Odile BROCHAIN

Contact: odile.brochain@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Biosignaling	1	50	5
Core courses: Genes, proteins and cells	1	110	12,5
Systems Biology I	1	25	2,5
Systems Biology II	1	25	2,5
Animal Transgenesis	1	25	2,5
Current questions in evolutions	2	50	5
Development in questions	2	50	5
Functional genomics and precision medicine	2	50	5
Immuno-pathophysiology	2	25	2,5
Integrative microbiology	2	20	2,5
Introduction to biotherapies	2	25	2,5
Membrane dynamics	2		2,5
Development in questions	2	50	5
Synthetic biology	2	25	2,5

M2 COMPUTATIONAL NEUROSCIENCES AND NEUROENGINEERING

Director: Sabir JACQUIR

Contact: sabir.jacquir@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Physiological bases of neurosciences	1	25	3
Neurals bases of perception	1	25	3
Methods for measuring and stimulating neuronal activity	1	25	3
Machine Learning	1	25	3
Dynamical systems and computational neuroscience	1	25	3
Closed loop neurosciences	1	25	3

M2 GENE CELL DEVELOPMENT

Director: Anne-Hélène MONSORO-BURCQ

Contact: anne.monsoro-burq@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Bioimaging	1	25	3
Cellular Dynamics and Communication	1	31	3
Genetic and Cellular Approaches to Development	1	30	3
Neural stem cells and neural developments	1	15	3
Small RNAs and Epigenetics	1	25	3

M2 PREDICTIVE AND INTEGRATIVE ANIMAL BIOLOGY (PRIAM)

Director: Etienne VERRIER

Contact: etienne.verrier@agroparistech.fr

This programme is taught at AgroParis Tech, a member of Université Paris-Saclay

COURSE	Semester	Hours	ECTS
Animal experiment, ethics and good practices in biology	1	27	2
Biostatistics, models and software	1	24	2
Principles and methods in animal genetics	1	18	1
Integrative analysis of reproduction	1	21	2
Quantitative and statistical genetics	1	39	3
Genome analysis	1	30	3
Genetic diversity and population management	1	39	3
Modeling from organs to herd and resource allocation	1	66	4
Precision livestock management: application of quantitative biology and predictive models	1	18	1
Advanced animal genetics	1	18	1
Adaptation	1	18	1
Epidemiology and health	1	18	1
Applied Ethology	1	18	1
Epigenetics and genes regulations	1	18	1

M2 SYSTEMS AND SYNTHETIC BIOLOGY

Director: Ioana POPESCU

Contact: ioana.popescu@univ-evry.fr

This programme is taught at Université d'Evry, a member of Université Paris-Saclay

COURSE	Semester	Hours	ECTS
Genomic applications in environmental biotechnology	1	6	2
Conception, construction and characterization of biological parts and devices	1	6	2
Metabolic Engineering	1	18	2
Biosafety and ethical questions of synthetic	1	8	2
Synthetic Biology	1	40	8
Cell Factory Optimisation	1	40	5
Statistical analysis of biological sequences and gene expression	1	12	2,5
Statistical learning of biological networks	1	12	2,5
Formal methods applied to biological system engineering and modeling	1	12	5
Test applied to biological objects	1	16	2,5
Nanobiology	1	12	2,5
Chips for molecular evolution	1	20	2,5
Eucaryotic cells engineering	1	40	5
Computational protein design	1	12	2,5
Practical course on rational protein design	1	20	2,5

Chemistry

The Department of Chemistry includes all the research and teaching activities in chemistry of the Faculty of Sciences of Orsay within Université Paris-Saclay.

It offers in particular Bachelor and Master's degree in chemistry with various courses and specialties.

The research activities in chemistry are carried out in five research laboratories and cover a large number of sub-disciplines: **organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry, theoretical chemistry, radiochemistry, materials chemistry...**

200 researchers and teacher-researchers

120 doctoral and post-doctoral researchers working in 5 mixed research units (UMR) associated with the CNRS (Scientific Research National Center):

- ICMMO (Institut de Chimie Moléculaire et des Matériaux d'Orsay, UMR 8182)
- ICP (Institut de Chimie Physique, UMR 8000)
- ISMO (Institut des Sciences Moléculaires d'Orsay, UMR 8214)
- IJCLab (Laboratoire de Physique des 2 Infinis Irène Joliot Curie, UMR CNRS)

110 teacher-researchers

55 doctoral-teachers and a associate professor assure the majority of the courses, tutorials and practices in chemistry.

50 administrative, technical, social and health staff



Mobility coordinator: Dr. Philippe BERDAGUÉ
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M1 CHEMISTRY - INTERNATIONAL TRACK

Director: Laure CATALA

Contact: laure.catala@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Analytical methods (IR & UV-Vis spectroscopies, NMR, MS)	1	50	5
Introduction to biophysics and microscopies for life sciences	1	50	5
Kinetics / Electrochemistry	1	50	5
Organic / Inorganic chemistry towards sustainability	1	50	5
Quantum mechanics	1	50	5
Soft Matter and Chemistry	2	50	5
Spectroscopies for solid state	2	50	5
Photo- and electrostimulations : from fundamentals to applications and devices	2	50	5
Practical courses	2	50	5
Internship	2	50	5

M1 CHEMISTRY ERASMUS MUNDUS

Director: Laure CATALA

Contact: laure.catala@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Analytical methods (IR & UV-Vis spectroscopies, NMR, MS)	1	50	5
Introduction to biophysics and microscopies for life sciences	1	50	5
Kinetics / Electrochemistry	1	50	5
Quantum mechanics	1	50	5
Organic / Inorganic chemistry towards sustainability	1	50	5
Transferable skills: Patent Law, Scientific writing, Career objectives	1	50	6

M2 CHEMISTRY - INTERNATIONAL TRACK

Director: Nicolas RABASSO

Contact: nicolas.rabasso@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Chemistry for renewable energy: from advanced research to industrial applications	1	50	6
Femtochemistry	1	25	3
Fundamentals in data science and machine learning	1	30	3
Nanoparticles and Advanced radiation therapies	1	50	6
Nanosciences	1	50	6

Computer Sciences

The computer science department of Université Paris-Saclay covers a large spectrum of research and formation. It has connections with the most important research French institutions, as CNRS, INRIA, CEA and INRA.

Bachelor degree consists of two tracks: **computer science and computer science applied to business management.**

At master level, three tracks are offered: **bioinformatics, computer science and computer science applied to business management.**

Thanks to its participation in international projects, the computer science department also delivers teaching in English at master level.

2 laboratories gather the research activities:

- LRI (Laboratoire de Recherche en Informatique)
- LIMSIS (Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur)



Mobility coordinator: Dr. Dominique QUADRI
dominique.quadri@universite-paris-saclay.fr

MASTER ARTIFICIAL INTELLIGENCE (AI) – M1 AI

Director: Kim GERDES, Isabelle GUYON

Contact: kim.gerdes@universite-paris-saclay.fr, isabelle.guyon@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Applied statistics	1	21	2,5
Mathematics for data science	1	21	2,5
Datacomp 1	1	21	2,5
Scientific programming	1	21	2,5
Introduction to machine learning (Machine learning 1)	1	21	2,5
Optimization	1	21	2,5
History of artificial intelligence	1	21	2,5
Data camp	1	21	2,5
Machine learning 2	1	21	2,5
Information retrieval	1	21	2,5
Project A	1	21	2,5
Deep learning	1	21	2,5
Information theory	1	21	2,5
Datacomp 2	1	21	2,5
Applied statistics	1	21	2,5
Mathematics for data science	1	21	2,5
Data Comp 1	1	21	2,5
Project B	1	21	2,5

MASTER ARTIFICIAL INTELLIGENCE (AI) – M2 AI

Director: Kim GERDES, Isabelle GUYON

Contact: kim.gerdes@universite-paris-saclay.fr , isabelle.guyon@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Probabilistic generative models	1	21	2,5
Signal processing	1	21	2,5
Graphical models	1	21	2,5
Advanced optimization	2	21	2,5
Reinforcement learning	1	21	2,5
Learning theory and advanced machine learning	2	21	2,5
Deep learning for natural language processing	1	21	2,5
Text mining and chatbots	2	21	2,5
Image understanding	1	21	2,5
Voice recognition and automatic language processing	1	21	2,5
Image mining	1	21	2,5
Multilingual natural language processing	2	21	2,5

MASTER DATA SCIENCE (DSC) – M1 DSC – EIT DIGITAL

Director: Kim GERDES

Contact: kim.gerdes@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Applied statistics	1	42	2,5
Mathematics for data science	1	21	2,5
Datacomp 1	1	21	2,5
Scientific programming	1	21	2,5
Innovation & Entrepreneurship – Basics 1 & 2	1	21	6
French Language and Culture 1 & 2	1	21	2
Introduction to machine learning (Machine learning 1)	1	21	2,5
Machine learning 2	2	21	2,5
Optimization	1	21	2,5
Information retrieval	2	21	2,5
Innovation & Entrepreneurship – BDLab 1 & 2	2	64	9
Innovation & Entrepreneurship – Advanced 1 & 2	2	42	5
Summer school	2	2 weeks	4
Deep learning	2	21	2,5
Project B	2	21	2,5
Datacomp 2	2	21	2,5
History of Artificial Intelligence	2	21	2,5
Data camp	1	21	2,5
Information theory	1	21	2,5

MASTER DATA SCIENCE (DSC) – M2 DSC – EIT DIGITAL

Director: Kim GERDES

Contact: kim.gerdes@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Probabilistic generative models	1	21	2,5
Deep learning for natural language processing	1	21	2,5
Text mining and chatbots	2	21	2,5
Innovation & Entrepreneurship – Study	1	21	6
Career seminar 1 & 2	1	21	5
Image understanding	1	21	2,5
Image mining	1	21	2,5
Graphical models	1	21	2,5
Reinforcement learning	1	21	2,5
Voice recognition and automatic language processing	1	21	2,5
Learning theory and advanced machine learning	1	21	2,5
Advanced optimization	1	21	2,5
Multilingual natural language processing	1	21	2,5
Master Thesis	1	6 months	30

MASTER HUMAN COMPUTER INTERACTION (HCI) – M1 HCI

Director : Ouriel GRYSZPAN

Contact: ouriel.grynszpan@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Programming of Interactive System	1	21	5
Fundamental of Human Computer Interaction 1 & 2	1	21	5
Fundamental of eXtended Reality	1	21	2,5
Design of Interactive System	1	21	2,5
Elective 1	1	21	2,5
Evaluation of Interactive System	1	21	2,5
Serious games + Project	1	21	5
Creative Design + Project	1	21	5
Virtual Human + Project	1	21	5
Winter School 1 & 2	2	21	5
Mixed Reality & Tangible Interaction + Project	2	21	5
Advanced Immersive Interaction + Project	2	21	5
Experimental Design & Analysis	2	21	2,5
Situated Interaction	2	21	2,5
Advanced Design of Interactive Systems	2	21	2,5
Elective 2	2	21	2,5
Elective 3	2	21	2,5
Studio Art Science	2	21	2,5
Gestural & Mobile Interaction	2	21	2,5
Digital Fabrication	2	21	2,5
Interactive Information Visualization + Project	2	21	5
Interactive Machine Learning + Project	2	21	5
Elective 4	2	21	2,5

MASTER HUMAN COMPUTER INTERACTION (HCI) – M2 HCI

Director : Ouriel GRYNSPAN

Contact: ouriel.grynszpan@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Advanced Programming of Interactive System	1	42	5
Design Project 1 & 2	1	42	5
Career seminar 1 & 2	1	21	5
Serious games + Project	1	21	5
Creative Design + Project	1	21	5
Virtual Human + Project	1	21	5
Mixed Reality & Tangible Interaction + Project	1	21	5
Advanced Immersive Interaction + Project	1	21	5
Experimental Design & Analysis	2	21	2,5
Situated Interaction	2	21	2,5
Advanced Design of Interactive Systems	2	21	2,5
Elective 1	2	21	2,5
Elective 2	2	21	2,5
Master Thesis	2	6 months	30

MASTER HUMAN COMPUTER INTERACTION (HCID) – M1 HCID – EIT DIGITAL

Director : Sarah FDILI ALAOUI

Contact: sarah.fdili-alaoui@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Programming of Interactive System	1	42	5
Fundamental of Human Computer Interaction 1 & 2	1	42	5
Fundamental of eXtended Reality	1	21	2,5
Design of Interactive System	1	21	2,5
Innovation & Entrepreneurship – Basics 1 & 2	1	21	6
French Language and Culture 1 & 2	1	21	2
Evaluation of Interactive System	1	21	2,5
Serious games + Project	1	21	5
Creative Design + Project	1	21	5
Virtual Human + Project	1	21	5
Innovation & Entrepreneurship – BDLab 1 & 2	2	64	9
Innovation & Entrepreneurship – Advanced 1 & 2	2	42	5
Winter School 1 & 2	2	21	5
Mixed Reality & Tangible Interaction + Project	2	21	5
Advanced Immersive Interaction + Project	2	21	5
Experimental Design & Analysis	2	21	2,5
Situated Interaction	2	21	2,5
Advanced Design of Interactive Systems	2	21	2,5
Gestural & Mobile Interaction	2	21	2,5
Digital Fabrication	2	21	2,5
Interactive Information Visualization + Project	2	21	5
Interactive Machine Learning + Project	2	21	5
Innovation & Entrepreneurship – Summer School	2	21	4

MASTER HUMAN COMPUTER INTERACTION (HCID) – M2 HCID – EIT DIGITAL

Director : Sarah FDILI ALAOUI

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COURSE	Semester	Hours	ECTS
Advanced Programming of Interactive System	1	42	5
Design of Interactive System	1	21	2,5
Design Project 1 & 2	1	42	5
Innovation & Entrepreneurship – Study	1	21	6
Career seminar 1 & 2	1	21	5
Serious games + Project	1	21	5
Evaluation of Interactive System	1	21	5
Serious games + Project	1	21	5
Creative Design + Project	1	21	5
Virtual Human + Project	1	21	5
Mixed Reality & Tangible Interaction + Project (Mix Real & TI)	2	21	5
Advanced Immersive Interaction + Project (Adv Immersive Int)	2	21	5
Experimental Design & Analysis (Exp Design Ana)	2	21	2,5
Situated Interaction (Situated Int)	2	21	2,5
Advanced Design of Interactive Systems	2	21	2,5
Master Thesis	2	6 month	30

Earth and Universe Sciences

The Earth and Universe Sciences department offers teaching of diverse specialities within its Master "**Earth and Universe Sciences, Environment**", STePE

- **Geological Engineering**
- **Hydrology and Hydrogeology**
- **Sedimentary Basins for the Energy Transition**
- **Soil Management and Ecosystem Services** (managed by AgroParisTech)
- **Planetology and Space Exploration** (managed together with University Versailles Saint-Quentin-en-Yvelines)
- **Arctic Studies** (managed by University Versailles Saint-Quentin-en-Yvelines)
- **Climate Studies** (managed by University Versailles Saint-Quentin-en-Yvelines)

Research is conducted at **GEOPS** laboratory which gathers

5 research units
42 teaching and researcher staff
2 post-docs
30 Phd students
24 technical and administrative staff



Mobility coordinator: Hermann ZEYEN
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M2 ARCTIC STUDIES

Director: Julien JUMELET

Contact: julien.jumelet@latmos.ipsl.fr

This program is taught at Université de Versailles Saint-Quentin-en-Yvelines, a member of Université Paris-Saclay

COURSE	Semester	Hours	ECTS
Risk Management	1	18	2
Physical Sciences of the Earth	1	24	2
Language and scientific writing (English or French)	1	20	2
Introduction to observation methods - SIMO	1	32	3
Governance and sustainability	1	18	2
Environmental Science for the Arctic	1	28	4
Climatic system	1	24	3
Arctic Climate and Meteorology	1	24	4
Arctic travel literature	1	18	2
Arctic Societies	1	28	4
Arctic Geopolitics	1	18	2
Arctic anthropology	2	24	4

Mathematics

The Mathematics Department of Université Paris-Saclay covers a large spectrum of research and formation in pure and applied mathematics. It has connections with the most important research French institutions, as CNRS, CEA, INRAE and INRIA.

The mathematics Department offers a complete formation program in all the levels of the LMD. In particular, it offers a Master's level education program together with the other members of Paris-Saclay University, in the following specialities:

- Geometry, Analysis and Arithmetic ;
- Probabilities and Statistics ;
- Machine Learning ;
- Data Sciences ; Analysis, Modelling and Simulation ;
- Optimisation ;
- Mathematics for the Life Sciences.

The Mathematics Department has around **300 members**, including about **140 permanent researchers**, university lecturers and professors, and about **100 PhD students**.

The researchers of the department are divided into five research teams:

- Harmonic Analysis,
- Numerical Analysis and Partial Differential Equations,
- Arithmetic and Algebraic Geometry,
- Probabilities and Statistics
- Topology and Dynamics.

There are strong interactions with other science fields such as biology, medicine, physics, and aeronautics.

The doctoral research also benefits from the high level of the interaction with the Paris-Saclay members.



Mobility coordinator: Filipa CAETANAO
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M1 JACQUES HADAMARD TRACK

Director: Nicolas BURCQ

Contact: nicolas.burq@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Probabilities	1	108	7,5
Distributions, Fourier Analysis	1	108	7,5
Algebra	1	108	7,5
Spectral Theory and Harmonic Analysis	1	48	5
Mathematics for Artificial Intelligence 1	1	48	2
Evolution Problems	2	108	7,5
Statistics	2	108	7,5
Arithmetics	2	108	7,5
Mathematics for Artificial Intelligence 2	2	48	5

M2 OPTIMIZATION

Director: Quentin MÉRIGOT

Contact: quentin.merigot@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Advanced Continuous Optimization I	1	30	5
Optimal Control of ODEs	1	30	5
Introduction to Operational Research and Combinatorics	1	30	5
Dynamical Programming	1	30	5
Game Theory	1	30	5
Advanced Continuous Optimization II	1	30	5
Calculus of Variations	1	30	5
Derivative-Free Optimization	1	30	5
Stochastic Optimization	1	30	5
Advanced game theory and applications	1	30	5
Optimal Transport	1	30	5
Geometric Control	1	30	5
Tropical Algebra in Games and Optimization	1	30	5
Optimal Control of PDEs	1	30	5
Dynamics of information and communication in games	1	30	5

Physics

The physics department offers a quality and multidisciplinary education at bachelor and master level.

Bachelor: applied physics, mechanics, fundamental physics, chemistry, education, electronics – electrical engineering and automation.

Master: physics, mechanics, energy, nuclear engineering, material science and engineering, education, electronics – electrical engineering and automation, training of teachers, earth and universe science, environment.

The physics department is particularly open to international students, and provides a large choice of English taught courses at the 3rd year Bachelor's level as well as at the Master's level.

Orsay campus gathers 50 % of the research potential of Université Paris-Saclay.

- 21 laboratories
- 900 researchers
- 200 teachers - researchers



Mobility coordinator: Mathieu LANGER

Contact: international-physics.sciences@universite-paris-saclay.fr

BACHELOR 3RD YEAR

Director: Patrick PUZO

Contact: patrick.puzo@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Analytical Mechanics	1	54	3
Quantum Mechanics I	1	48	5
Quantum Mechanics II	2	24	2,5
Advanced Topics in Quantum Mechanics	2	30	2,5
Mathematics	1	72	7
Electromagnetism & Optics I	1	48	5
Electromagnetism & Optics II	2	38	4
Statistical Physics	2	30	6
Special Relativity	2	25	3
Experimental project	2	66	6
Experimental work	1&2	14	2
Introduction to Dynamical Systems	2	25	2,5
Ways of seeing, ways of knowing	2	25	2,5
Physics of architecture	2	25	2,5

M1 GENERAL PHYSICS

Directors: Grégory MOREAU and Mathieu LANGER

Contacts: gregory.moreau@universite-paris-saclay.fr
mathieu.langer@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Atoms, Molecules and Optics	1	40	5
Particles, Nuclei and Universe	1	70	8
Solid State Physics	1	70	8
Light-Matter interactions in molecular media	1	30	3
Non-linear optics	1	30	3
Plasma physics and applications	1	30	6
Soft matter	2	30	6
Mathematical and statistical methods, from big data to relevant information	1	30	3
Programming and numerical methods-e-learning	2	10	
Sensors, measurements, and signal processing	1	50	3
Experimental Physics	1	50	6
Statistical and Quantum Field Theory	2	70	8
Astrophysics and Astroparticles	2	50	6
General Relativity & Cosmology	2	50	6
Nuclear and Particles Physics	2	50	6
Quantum Effects at Macroscopic Scale	2	50	6
Nanomaterials and Electronics Applications	2	36	4
Advanced mathematics for physicists	2	30	3

MASTER NUCLEAR ENERGY : M1

Directors: Matthieu LEBOIS and Aurelien DEBELLE

Contacts: matthieu.lebois@universite-paris-saclay.fr

aurelien.debelle@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Basic Nuclear Physics	1	30	3
Thermodynamics	1	30	3
Chemical Engineering	1	27	3
Basic Neutronics	1	30	3
Interactions of Radiations with Matter	1	20	2
Solution Chemistry 1: speciation and process	1	36	3
Chemistry of Materials	1	33	4
Mathematics for Chemists	1	42	4
Radiolysis	1	24	3
Economics of Energy	2	23	2
Project management	2	42	4
Energy Production Technologies	2	30	3
Data processing	2	27	3
Solution Chemistry 2: separation chemistry	2	24	2
Atomic and molecular spectroscopy	2	33	3
Nuclear Analysis Methods	1	30	2
Electrical power engineering	1	46	4
Material science & mechanics	1	27	3
Mathematics for Physicist	1	42	4

MASTER NUCLEAR ENERGY: M2

Directors: Gael SATTONAY and Anne-Lise GLOANNEC

Contacts: gael.sattonay@universite-paris-saclay.fr
anne-lise.gloannec@ensta-paris.fr

COMMON CORE TRACK			
COURSE	Semester	Hours	ECTS
PWR Functional Description	1	24	3
Introduction to safety / Critically Safety	1	24	3
Nuclear Fuel Cycles / Nuclear Reactor Systems	1	27	3
Radioprotection	1	28,5	4

NUCLEAR REACTOR PHYSICS SPECIALITY			
COURSE	Semester	Hours	ECTS
Nuclear Physics Introduction	1	42	4
Nuclear Materials	1	42	4
Reactor Physics and Simulation	1	27	3
Thermohydraulics	1	33	4
Neutronics 1	1	39	4
Neutronics 2	2	60	4
Multiphysics and Uncertainties	2	15	2
Advanced Thermohydrolics	2	36	

NUCLEAR POWER PLANT DESIGN SPECIALITY

COURSE	Semester	Hours	ECTS
Material Physics : Concrete	1	24	2
From seismology to earthquakes engineering	1	27	2
Calculation codes	1	30	2
Nuclear Physics and Neutronics	1	27	3
Thermoydraulics	1	33	4
Systems and equipments	2	39	4
Numerical design	2	33	3
Material Physics Corosion	2	12	1
Design	2	24	2

NUCLEAR POWER PLANT OPERATIONS SPECIALITY

COURSE	Semester	Hours	ECTS
Operation Management	1	42	3
Thermohydraulics	1	33	4
Nuclear Physics and Neutronics	1	27	3
Risk Management	1	30	4
Safety and Production	2	42	4
Maintenance	2	42	4
Control command and control simulation	2	51	4,5

FUEL CYCLE SPECIALITY			
COURSE	Semester	Hours	ECTS
Separation and recycling	1	33	4
Fuel : from mine to reactor	1	21	3
Radiochemistry	1	24	2
Cooling and molten salts	1	21	2
Risk Management	1	30	4
Introduction to Nuclear Physics and Neutronics	1	24	2
Waste Conditionning	2	33	4
Radioactive Waste Management and Repository Design	2	27	3
Process, Simulation and Process Control	2	31	3

DECOMMISSIONING AND WASTE MANAGEMENT SPECIALITY			
COURSE	Semester	Hours	ECTS
Politics, Strategy and Management of Decommissioning	1	39	5
Dismantling and Waste Decommissioning	1	49	5
Risk Management	1	30	4
Introduction to Nuclear Physics and Neutronics	1	24	2
Waste Management	2	51	4
Methods of decommissioning	2	51	4
Methods of dismantling	2	42	4
Calculations Codes 1	2	18	2
Calculations Codes 2	2	27	2

M2 NUCLEI PARTICLES ASTROPARTICLES AND COSMOLOGY (NPAC)

Directors: Iolanda MATEA and Fabien LECAVALIER

Contacts: matea@ipno.in2p3.fr
cavalier@lal.in2p3.fr

COURSE	Semester	Hours	ECTS
Experimental project	1	112	6
Quantum Field Theory	1	60	6
Particles Physics	1	60	6
Astroparticles and Cosmology	1	60	6
From nuclei to stars	1	60	6
Detector Physics	1	30	3
General Relativity	1	30	3
Accelerator Physics	1	30	3
Advanced lecture	2	30	3
Computing course and project	2	30	3
Internship	2		24

M2 NANOSCIENCES INTERNATIONAL TRACK

Director: Arnaud BOURNEL

Contact: arnaud.bournel@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Electro and scanning probe microscopy and spectroscopy	1	30	3
Fabrication and characterization of nanodevices and Nanoobjects	1	30	3
Light-matter interaction in semi-conducting nanostructures	1	30	3
Microtechnology	1	27	3
Mobile Charges in physics and chemistry	1	27	3
Nanophotonics	1	27	3
Nanoelectronics and Molecular Electronics	1	27	3
Microtechnology	1	30	3
Numerical Simulation of Nanosystems	1	30	3
Non-equilibrium statistical physics	1	30	3
Outstanding compounds	1	30	3
Project	1	30	3
Exciton physics	1	30	3
Nanothermics	1	30	3
Thin film photovoltaics	1	30	3
Internship	2	30	24

M2 PHYSICS OF COMPLEX SYSTEMS

Director: Emmanuel TRIZAC

Contact: emmanuel.trizac@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Nonlinear physics and dynamical systems	1	27	3
Stochastic processes	1	74	6
Computational science	1	27	3
Statistical field theory	1	74	6
Advanced nonlinear physics	1	27	3
Advanced statistical mechanics	1	27	3
Nonequilibrium and active systems	1	27	3
Numerical simulations	1	27	3
Statistical Physics of simple and complex fluids	1	27	3
Biophysics	1	27	3
Quantum field theory	1	27	3
Mathematical tools	1	27	3
Complex networks	2	27	3
Interface physics/social sciences	2	27	3
Out of equilibrium statistical physics	2	27	3
Statistical field theory of complex matter	2	27	3
Machine learning	2	27	3
Econophysics	2	27	3

M2 PLASMAS, LASERS ACCELERATORS, TOKAMAKS (PLATO)

Director: Sophie KAZAMIAS

Contact: sophie.kazamias@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Relativity, electromagnetism and plasmas	1	25	80
Laser-Plasma physics	1	30	80
Tokamaks physics	1	30	3
Accelerators physics	1	30	3
Accelerators	1	41	50
High power lasers	1	50	50
Management and organisation of large scale facilities	1	30	3
Numerical methods	1	44	3
Physics and transverse technologies	1	30	3
Detection, measurement, signals	1	27	3
Practical manipulations close to large scale facilities	1	36	3
Projects and organization of large facilities	1	36	3
Detection, measurement	1	30	3
Irradiation, materials	1	30	3
Ultra-intense plasma / laser interaction	1	40	4
Dense plasmas	1	20	2
Detection, measure and radiation	1	30	3
Plasmas-materials interaction	1	30	3

M2 INTEGRATION CIRCUITS SYSTEMS

Director: Hervé MATHIAS

Contact: herve.mathias@universite-paris-saclay.fr

COURSE	Semester	Hours	ECTS
Analog Electronics 1 - Analog Devices and Circuits (EA1)	1	28,5	3
Fundamentals in AMS & RF Electronics (FARE)Methodologies (CAD2)	1	28,5	3
Digital Electronics 1 - Digital systems (EN1)	1	24	3
Digital Electronics 2 - Advanced architectures (EN2)	1	28,5	3
More-than-Moore - Functional diversification (MTM)	1	24	3
Advanced Analog-to-digital converters and Digital-to-Analog converters (CAN)	1	24	3
CAD of Mixed Integrated Circuit (CAD1)	1	27	3
Advanced Design Methodologies (CAD2)	1	30	3
Algorithms and Architectures for Digital Computing (A2HW)	1	40,5	3
Mixed-signal, Analog & RF Systems for communicating objects (SMART)	1	28,5	3
Nanoarchitectures (NARCHI)	1	16	3
Project	2		3
Internship	2		24

Application

APPLICATION DEADLINE

Autumn Semester May 15th

Spring Semester October 30th

APPLICATION PROCEDURE

Nomination and mandatory documents

1. The partner university selects students based on performance, commitment and language skills and nominates them for the exchange by sending a notification of nomination to the Incoming Mobility Officer at Université Paris-Saclay:
incoming-exchange.international@universite-paris-saclay.fr
2. **Students then apply online:**
<https://psud.moveonfr.com/locallogin/53c7d3520f9d307976000001/eng>
Students Applications should include the following documents:
 - Learning Agreement (signed and stamped by the departmental coordinator of the students' home institution)
 - Declaration of nomination (signed by the departmental coordinator of the students' home institution)
 - Official academic transcript of all grades obtained at the university (signed and stamped by the students' home institution)
3. Université Paris-Saclay will notify the students as to their acceptance within 5 weeks

FURTHER INFORMATION:

<https://www.universite-paris-saclay.fr/en/admission/etudiants-internationaux/study-period-universite-paris-saclay-exchange-programme-erasmus-or-bilateral-agreement>



Academic information

ACADEMIC YEAR

Autumn Semester: September – January

Winter Semester: February – June

For precise entrance dates, contact your host faculty

Université Paris-Saclay participates in several International (Erasmus Mundus) Master and PhD programmes, as well as other double Master degrees and English taught Master programmes:

<https://www.universite-paris-saclay.fr/en/study/masters-programmes-taught-english>

LANGUAGE COURSES

Université Paris-Saclay offers French language courses called “FLE”, for incoming international students. An intensive one-week course is offered at the beginning of the autumn semester, in addition to weekly courses held throughout the academic year. For details see

<https://www.universite-paris-saclay.fr/en/study/internationalisation-languages>

GRADING SYSTEM

At Université Paris-Saclay, grades are out of 20.

Paris-Saclay Grading System	
(18-20)/20	Outstanding
(16-18)/20	Excellent
(14-16)/20	Very Good
(12-14)/20	Good
(10-12)/20	Satisfactory/Pass
(0-9)/20	Fail
ABs	Absent

ACADEMIC TRANSCRIPTS

Université Paris-Saclay will issue an official transcript no later than 5 weeks after final grades are available.

ACCOMMODATION

Université Paris-Saclay cooperates with several student residences on and around the university campus. Priority for student housing will be given to students coming from institutions having an Erasmus Bilateral Exchange Agreement with Université Paris-Saclay. Rooms or studios are available (price range €200 - €500 / month)

Note that accommodation is not guaranteed by Université Paris-Saclay

• For more information:

<https://www.universite-paris-saclay.fr/en/campus-life/accommodation> or contact logement.etudiant@universite-paris-saclay.fr

UNIVERSITY LIFE

Université Paris-Saclay has many cultural and sports-orientated activities to complement student life on campus: <https://www.universite-paris-saclay.fr/en/campus-life/e-international-welcome-office>

BUDDY PROGRAMME

Université Paris-Saclay has a free mentoring programme for international students who have recently arrived in France for their studies. Register to have a buddy and meet other international and local students at events organised by the International Welcome Desk. More information: <https://www.universite-paris-saclay.fr/en/international-mentoring-programme-buddy-programme>

VISA REQUIREMENTS

Applicants from outside the European Community require a visa and a permit ("Titre de Séjour") in order to study in France. The first step in this procedure is to contact the French Embassy / Consulate in your country who will be able to instruct you.

• **For more information see:**

https://france-visas.gouv.fr/en_US/web/france-visas

contact: visa.etudiant@universite-paris-saclay.fr

INSURANCE:

Health insurance is mandatory in order to study in France. EU citizens are covered by their health insurance and must obtain a European Health Insurance Card before coming to France.

Non-EU citizens should register on **<https://etudiant-etranger.ameli.fr/#/>**

TRANSPORTS

Getting to Orsay

Orsay Campus is delivered by two REB B stations: Orsay-Ville and Bures-sur-Yvette.

From Paris-Charles-de-Gaulle

Take RER B to "Orsay-Ville" or "Saint-Rémy-lès-Chevreuse".

From Orly Airport

1. Take the Orlyval shuttle to Antony (9,30€).

2. In Antony take RER B to "Orsay-Ville" or "Saint-Rémy-lès-Chevreuse".

"Imagine R Etudiant" is the transport student pass for Paris and its region (Ile-de-France). It is reserved to students below 26 years old.

For 30€ per month (350 € per year) you will be able to travel by metro, bus, RER (urban train) and tramway.

You can subscribe online at **www.navigo.fr** or ask a form in any metro or train station for Imagine R Etudiant subscription.



LOCATIONS

- 1 **MEDICINE**, Le Kremlin-Bicêtre (Faculty)
- 2 **ELECTRICAL AND ELECTRONIC ENGINEERING - MECHANICAL ENGINEERING**, Cachan (Institute of Technology)
- 3 **LAW - ECONOMICS - MANAGEMENT**, Sceaux et Orsay (Faculty)
- 4 **MANAGEMENT - INTERNATIONAL TRADE**, Sceaux (Institute of Technology)
- 5 **PHARMACY**, Châtenay-Malabry (Faculty)
- 6 **SCIENCES**, Orsay (Faculty)
- 7 **SPORT SCIENCE**, Orsay (Faculty)
- 8 **CHEMISTRY - COMPUTER SCIENCE - APPLIED PHYSICS AND MEASURES**, Orsay (Institute of Technology)
- 9 **POLYTECH PARIS-SACLAY**, Orsay (Institute of Engineering)



CONTACT

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