



# MASTER IN AERONAUTICAL ENGINEERING



Polytechnic Institute of Advanced Sciences | School authorised to award the title of engineer



**Francis Pollet**  
General Director

"Discovering French aeronautical and space know-how is a major asset for a future master's degree.

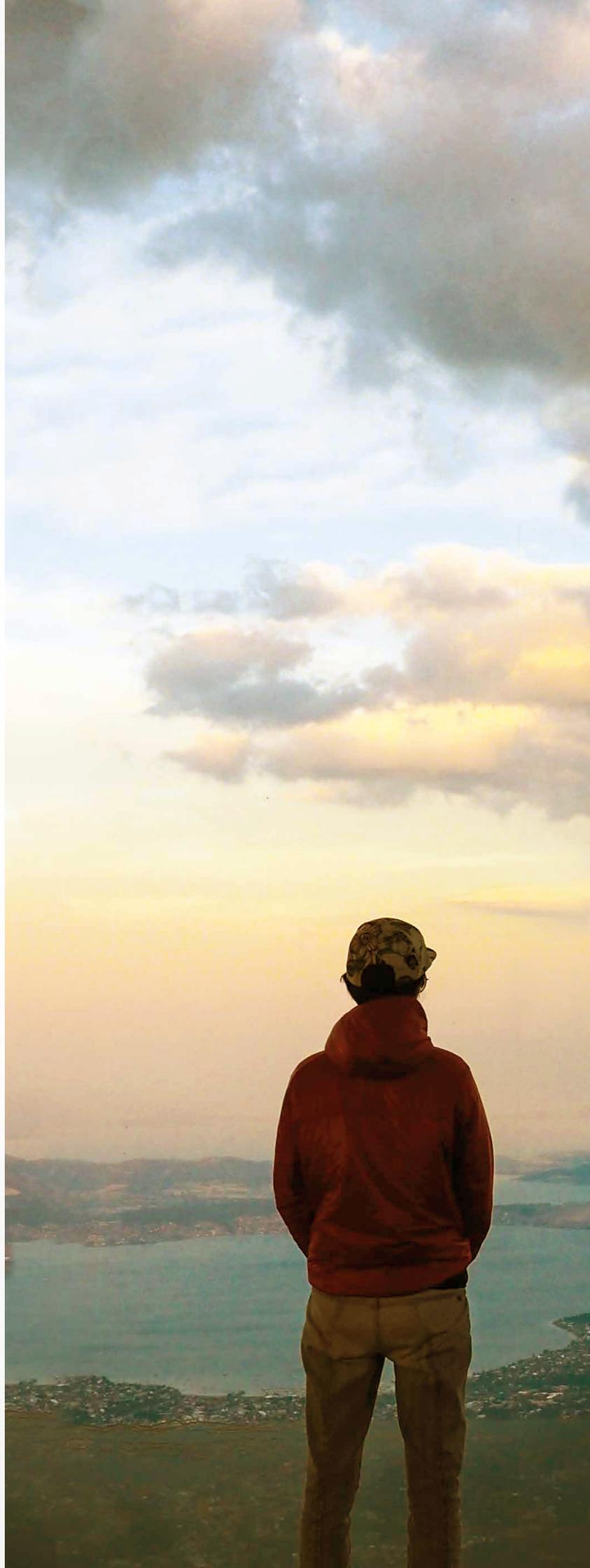
Accredited by the French Ministry of Higher Education, Research and Innovation, the IPSA Master's degree opens all the doors of global industry.

The requirement and mastery of the best technologies make it possible to achieve a very high level of competence.

The IPSA is at the gates of Paris, which offers a cultural space of the highest level.

You can choose between 3 fields:

vehicles (aerodynamics, propulsion structures and materials), space and systems (fly by wire, telecom, mechatronics)."



# IPSA, AN AERONAUTICS & SPACE GRADUATE ENGINEERING SCHOOL IN FRANCE



**IPSA is an engineering school offering a 5-year syllabus 100% dedicated to Aeronautics and Space.**

**The interest in 'everything Aerospace' is a particular source of motivation in the school and the passion is shared by both students and lecturers.**

Since its creation in 1961, IPSA has been driven by the constant concern to match the training provided to students with the needs of companies. Thus the Master programme is composed of majors and options which constitute axes of deepening essential to the acquisition of solid knowledge in their field. These developments have always been guided by the work of the school's development council.

The "diplôme d'ingénieur", equivalent to a Master in aeronautical engineering awarded by the IPSA places the graduate as able to tackle any problem related to aeronautics and space. IPSA training also allows graduates to work in related advanced fields of aeronautics and space, particularly in land transport, which uses techniques and technologies similar to those used in aeronautics.

IPSA is accredited by the "Commission des Titres d'Ingénieurs" (CTI, accreditation body for the French engineering schools) and holds the EUR-ACE® label and is part of the IONIS Education Group.

<https://www.ionis-group.com/>



# WHY STUDY

#1

## A sophisticated research enterprise

France ranks sixth in the world in terms of domestic spending on research and development. 16 of 55 Fields medals have been awarded to French nationals. 41.1% of the doctoral candidates in France are internationals.



#2

## A world-class economic power

France has the world's five-largest economy. Its gross domestic product ranks second in Europe, and the country is Europe's second largest market (IMF, 2014; Eurostat, 2014).



#3

## An appealing destination for international students

France is the world's 4<sup>th</sup> leading country for international students after the United States, the United Kingdom, and Australia (UNESCO, 2014).



#5

## A pleasant and satisfying style of life in the heart of Europe

Situated in the very heart of Europe, France is the world's top tourist destination in terms of number of foreign visitors (UNWTO, 2014). Paris is ranked the world's second best city for students (QS Best Student Cities, 2017).

#4

## An environment favorable to innovation and to young entrepreneurs

France is home to more of the world's top 100 most innovative companies than any other country in Europe (Thomson Reuters 2016). It ranks sixth in the world in number of international patent applications (WIPO, 2013)

#6

## French, an international language

French is the world's fifth most widely used language, with 274 million speakers. After English, French is the most widely studied language in the world. It is the world's third most common business language and second most common language of international news (OIF, 2014).



# IN FRANCE ?



#8

## France is one of the leading countries in the field of aerospace

Paris and Toulouse are the ideal cities for those passionate about aeronautics in industrial terms (with Airbus, Alcatel, Astrium, Thalès, Safran, etc) and in research with CNES, ONERA and numerous CNRS laboratories.  
(Source : CampusFrance, 2017)



## FRENCH KNOW HOW IN AEROSPACE

The French aerospace industry is precisely the second largest in the world, behind the United States and ahead of China, with a turnover of 69 billion dollars in 2017.

The position of the French aerospace industry, which is at the forefront of the world, is partly due to the success of prime contractors and a policy of industrial alliances, which have been able to win markets with complete products, but also markets of equipment manufacturers and subcontractors, to position themselves with foreign manufacturers

The success of the French aeronautics industry also depends on the quality of the human skills in France, both in the design offices and in the assembly plants. Its needs for engineers, management engineers and qualified technicians are significant.

IPSA curriculum of our Master degree fully meets the future expectations of French and world industry in the aeronautical field.



#7

## Advanced industries and international corporations that are leaders in their field

France is home to 31 of the world's 500 largest corporations (Fortune Global 500, 2014)

# IPSA IN FIGURES

**+65**  
partner  
universities



**+3000**  
alumni

**+1700**  
students  
on 2 campuses :  
Paris Ivry  
and Toulouse



**+200**  
partner  
industries

**40**  
student  
associations

**100%**  
of students  
hired within  
3 months  
after graduation



**28**  
weeks  
mandatory  
final internship

# OUR CURRICULUM

**IPSA Bachelor program (3 years) is taught in French in Paris and Toulouse (more campuses to open) and initiates students into the aerospace field.**

**The subjects studied are Mathematics, Physics, Aeronautical sciences, Computer sciences and Electronics. In their 3<sup>rd</sup> year, students can specialize in aerospace systems or aerospace vehicles.**

Our Master program (2 years) is fully taught in English (only in Paris). During these 2 years, students can individualize their courses through options and scientific majors (Energy and Propulsion, Mechanics and Aircraft Structures, Embedded Systems, Mechatronics, Space launchers and satellites, etc).

SEMESTER 7	SEMESTER 8	SEMESTER 9	SEMESTER 10
30 ECTS	30 ECTS	30 ECTS	30 ECTS
<b>Common core and specializations</b>	<b>Common core and specializations</b>	<b>Common core and options</b>	<b>End of study Internship</b>
<b>Vehicles or Systems</b>	<b>SET:</b> Embedded Systems and Telecommunications	<b>SAA:</b> Autonomous airborne systems	<b>In a company</b>
	<b>SM:</b> Mechatronic Systems	<b>TIE:</b> Embedded information management and processing	
	<b>EP:</b> Energetics and Propulsion	<b>CAE:</b> Airframe and materials	
	<b>MS:</b> Mechanics and Structures	<b>EMO:</b> Energetics and Engines	
	<b>ELS:</b> Space, Launchers and Satellites	<b>ELS:</b> Space, Launchers and Satellites	
		<b>MPI:</b> Management des projets industriels (taught in french)	
		<b>MPM:</b> Management de la Production et du MCO (taught in french)	

# SEMESTER 7

MODULES	SUBJECTS
<b>Cultural integration</b>	Intensive French language courses
	Getting over culture shock and going beyond national stereotypes
<b>Common core</b>	Probability and Statistics for Engineering
	Linear and Continuous Systems Design
	Linear Systems State Space Representation
	Perfect Fluid Dynamics
	Introductory Course in Avionics
	Human sciences
<b>Specialization</b>	<p><b>Vehicles :</b></p> <ul style="list-style-type: none"> <li>• Introduction to Mechanical Vibrations and Structural Dynamics</li> <li>• Real Fluid Dynamics</li> </ul> <p><b>Systems :</b></p> <ul style="list-style-type: none"> <li>• Digital Control System Design</li> <li>• Microcontrollers and their applications</li> </ul>

# SEMESTER 8

MODULES	SUBJECTS	MAJORS
<b>Cultural integration</b>	French language programme for engineers	
<b>Common core</b>	Engineering sciences	
	Electives modules	
	Introducing Project to Research or Innovation (PIRI)	
	Human Sciences	
	Business exposure	
<b>Specialization</b>	<p><b>Vehicles:</b></p> <ul style="list-style-type: none"> <li>• Fluids dynamics</li> <li>• Numerical calculations in mechanics and structures (FEM)</li> <li>• Energetics and sustainable design</li> </ul>	<p><b>EP:</b> Turbomachine design, thermal motors or drone and light aircraft, Behavior law for materials</p>
		<p><b>MS:</b> Aircraft structures design, Composite materials, CAD CATIA, Behavior law for materials</p>
		<p><b>ELS:</b> Space mechanics, Space optics, Plasma physics and propulsion</p>
	<p><b>Systems:</b></p> <ul style="list-style-type: none"> <li>• Complex information systems modelling <ul style="list-style-type: none"> <li>• Real time systems</li> <li>• Embedded networks</li> </ul> </li> <li>• Physical approach to aeronautical automated systems</li> </ul>	<p><b>SET:</b> Advanced applications of RPGA circuits, Telecommunications, Guide propagation and hyperfrequencies</p> <p><b>SM:</b> Power electronics in aeronautics, Guidance principles of autonomous systems, Swarm intelligent systems, Introduction to robotics</p> <p><b>ELS:</b> Space mechanics, Space optics, Plasma physics and propulsion</p>

# SEMESTER 9

MODULES	SUBJECTS	OPTIONS
<b>Common core</b>	<ul style="list-style-type: none"> <li>• Human Sciences</li> <li>• Corporate knowledge</li> <li>• Ethics</li> </ul>	
<b>Specialization</b>	<p><b>Vehicles:</b></p> <ul style="list-style-type: none"> <li>• Hypersonic aerodynamics introduction</li> <li>• Reliability and fatigue of structures</li> <li>• Computational Fluid Dynamics (CFD)"</li> </ul>	<p><b>CAE:</b></p> <p>Vertical flight, Calculations of structural materials, Finite Element Method (FEM), Multi-body mechanical simulation</p>
		<p><b>EMO:</b></p> <p>Turbine engines, Combustion, Aeroacoustics, Turbulences, Alternatives energies propulsion</p>
		<p><b>ELS:</b></p> <p>Satellites design, Launchers design, Space propulsion systems, Payload integration and launchers</p>
	<p><b>Systems:</b></p> <ul style="list-style-type: none"> <li>• Aircraft modelling</li> <li>• Electromagnetic compatibility and antennas</li> <li>• Systems design and fast prototyping</li> </ul>	<p><b>SAA:</b></p> <p>Artificial intelligent control, Intelligent systems, Drones and visual servoing, Nonlinear systems control</p>
		<p><b>TIE:</b></p> <p>Embedded systems, Airborne sensors and data transmission, Real-time operating systems, Image processing with RPGA, Aeronautic telecom systems</p>
		<p><b>ELS:</b></p> <p>Satellites design, Launchers design, Space propulsion systems, Payload integration and launchers</p>
<p><b>Management (taught in french):</b></p> <ul style="list-style-type: none"> <li>• Cost management</li> <li>• Supply chain</li> <li>• Project management</li> </ul>	<p><b>MPI:</b></p> <p>International negotiations, Management control, Risk analysis, Business management simulation</p>	
	<p><b>MPM:</b></p> <p>Supply chain, Quality management, Production management control, Stock management, Airworthiness</p>	

# SEMESTER 10

**Final 6-month internship monitored by IPSA and Master's thesis presented on-campus in front of the Graduate Committee.**



# RESEARCH LABORATORIES

At the crossroads of the Industrial and Academic worlds, research is one of the fundamental axes of the IPSA pedagogy. IPSA has 7 research laboratories:



1

**Laboratory  
in Autonomous Aerial  
Systems (LS2A)**

2

**Laboratory  
in Intelligent Systems  
(LS2I)**

3

**Laboratory  
in Complex Systems  
(LSCI)**

4

**Laboratory in Numerical  
Simulation and  
Calculations (LSNC)**

5

**Laboratory in Thermal  
and Thermodynamics  
(L2TI)**

6

**Laboratory in Materials  
and Structures Mechanics  
(L2MS)**

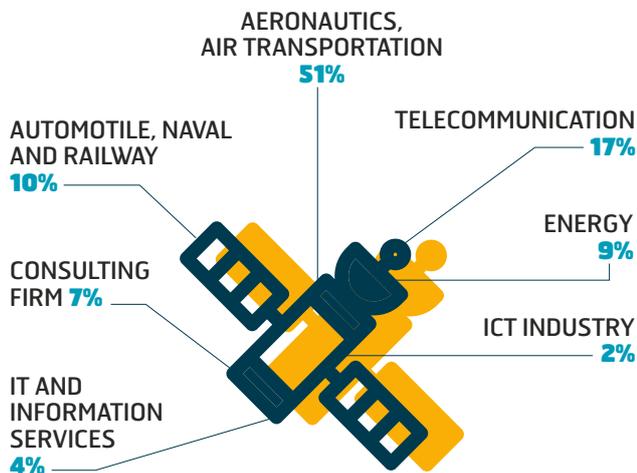
7

**Laboratory  
in Aerodynamic testing  
and Modelling (LEMA)**

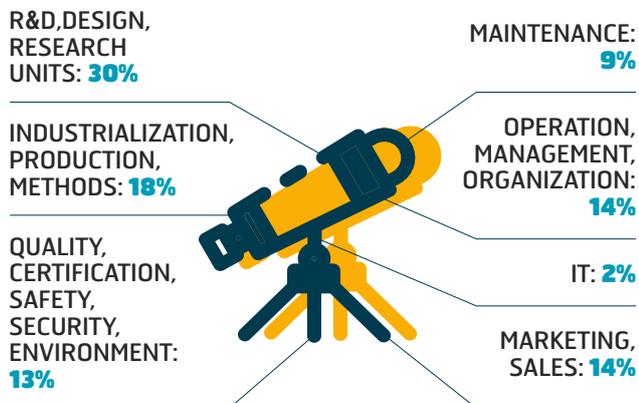


# OPPORTUNITIES & CAREERS

## COMPANIES' BUSINESS SECTORS



## OUR GRADUATES' FIELDS OF ACTIVITY



## CLASS 2016, FIRST JOB IN AERONAUTICS AND SPACE

83% of graduates found their first job within three months after leaving school, 68% of them work in the aeronautics and space sectors: constructors, equipment manufacturers, subcontractors and SMEs. Engineering companies are always major recruiters and are well established with clients. Some of them have started their own businesses. The gross annual salary is €39.8k.

## COMPANIES WHERE OUR GRADUATES WORK

AÉROPORTS DE PARIS	MATRA ÉLECTRONIQUE
AFD TECHNOLOGIES	MBDA
AIGLE AZUR	MCA INGÉNIERIE
AIR ET COSMOS	NEXTER
AIR FRANCE	NMJ SERVICES
AIRBUS	OBSERVATOIRE DE PARIS
AIRBUS HELICOPTERS	ONERA
AKKA TECHNOLOGIES	OCTONION
ALTEN	PATROUILLE DE FRANCE
ALTRAN	PLANITEC
AMARIS	POTEZ AERONAUTIQUE
ARIANE GROUP	PSA
ARMÉE DE L'AIR	RATP
ASSYSTEM	RENAULT
ATR AIRCRAFT	ROLLS-ROYCE
AUSY	SABCA
AVIATION DESIGN	SABENA TECHNICS
CEA	SAFRAN
CEGELEC	SAFRAN AIRCRAFT ENGINES
CITÉ DE L'ESPACE	SAFRAN ELECTRICAL & SCALIAN
CM DRONES	POWER SAFRAN
CNES	HELICOPTER ENGINES
COMPOSITE INDUSTRIE	SAFRAN LANDING SYSTEMS
CORSAIR INTERNATIONAL	SAFRAN NACELLES
DAHER AEROSPACE	SAFRAN TRANSMISSION SYSTEMS
DASSAULT DS	SEGULA TECHNOLOGIES
DASSAULT FALCON SERVICE	SNCF
DAVIDSON CONSULTING	SOGÉCLAIR AEROSPACE
DEDIENNE AEROSPACE	SOGETI HIGH TECH
DERICHEBOURG	SONOVISION LIGERON
AEROSPACE	SOPRA - STERIA
DGAC	STELIA AEROSPACE
DIRECTION GÉNÉRALE DE L'ARMEMENT	STUDEC
DRONE VOLT	THALES
ECM	TRANSAVIA
EMBRAER	TRIGO-QUALITAIRE
INSTITUT JEAN MERMOZ	UTC AEROSPACE SYSTEMS
KUEHNE NAGEL	VALEO
LATÉCOËRE	WIJET
LIEBHERR AEROSPACE	
LISI AEROSPACE	

## INSTITUTIONAL PARTNERS

ZAF	ELLES BOUGENT
AEROSPACE VALLEY	EUROSPACE
ACADÉMIE DE L'AIR ET DE L'ESPACE	ISSAT
APEC	RAES
ASTECH	UFH

# OUR CAMPUS

**IPSA Paris is located on the Paris Ivry technology campus of the IONIS Education Group, which also includes ESME Sudria, a general engineering school, and ETNA, a computer science school on an work and study basis.**

**The 10,000m<sup>2</sup> premises consist of:**

- Classrooms
- Innovative and connected laboratories
- Associative rooms
- Living and dining areas

The clustering of these schools on the same campus makes it possible to develop collaborations based on the fields of specialization of each of them and contributes to the students' open-mindedness.

**Proximity to these schools thus takes different forms:**

- Organisation of joint events
- Collaboration on associative projects

Located 10 minutes from the capital, students benefit from the cultural and economic dynamism of Paris and its region, for their extracurricular activities and their professional integration.



# STUDENT LIFE

The passion and the dynamism of of IPSA students materializes through student associations. Whether they are of a cultural, sporting or technical nature, the students lead innovative, sometimes ambitious projects, where technological venture is at stake. Design and launch of rockets or drones, construction of a full size flight simulator for a Boeing 777, pilot training, model airplanes, but also music, team sports, video and many other things...  
IPSAiens student life is full of passion.

## OUR ASSOCIATIONS

### IN PARIS

• **BDE IPSA:**  
Animation of student life by the Students Association

• **Bureau des Sports:**  
Sports Association

• **Aéro IPSA:**  
Design and build of experimental rockets

• **IPSA Technologies:**  
Design and build of drones

• **Evolutek:**  
Robots

• **IPSA Flight:**  
Construction of a flight simulator for a Boeing 777

• **Mach 0.1:**  
Flying gliders

• **IPSA KART:**  
Karting

• **Bureau des Arts:**  
Cultural events

• **STUD'ACT:**  
Humanitarian and solidarity Actions

# ACCOMMODATION



IPSA doesn't have dormitories.  
However we have an online platform to help students. To find an accommodation.  
This platform gives access to a wide selection of offers from residences and private owners. It also gives access to a multilingual team available 6 days a week to help with the documents, the financial help, etc.  
The support team from the online platform can assist the students with the procedure as well as their "IPSA buddy".

**<https://logement.ipsa.fr>**

Finding an accommodation in Paris can be quite difficult, especially at the beginning of each semester.  
We do recommend to search for an accommodation as early as possible.

# HOW TO **APPLY ?**

## ELIGIBILITY

**Our Master of Engineering is open to candidates holding a 3-year bachelor's degree (or equivalent) in Aerospace Engineering, Mechanical Engineering, Electrical and Electronic Engineering, Mechatronic Engineering or related fields.**

Application documents must be sent to **[freemover@ipsa.fr](mailto:freemover@ipsa.fr)**

All documents must be in French or English, in pdf format.

- Curriculum Vitae
- Official university transcripts
- Certified copy of your Bachelor's degree
- 2 letters of recommendation
- Copy of passport
- TOEFL 79, TOEIC 785, IELTS 5,5 or Cambridge BULATS record results
- ID photo
- Statement of purpose
- Proof of payment of the application fee

Admission upon application, possibly with an interview on skype.

## **FEES PER ACADEMIC YEAR**

Application fee : 110 euros

Registration fee per year : 990 euros

Tuition fee per year : 9 135 euros

**APPLICATION DEADLINE :**

**May 15<sup>th</sup>**





# CONTACT US

## IPSA

63 bis boulevard de Brandebourg 94 200 Ivry sur Seine

[freemover@ipsa.fr](mailto:freemover@ipsa.fr)

IPSA is located in the South East of Paris. It is easily accessible by road and public transports.



[www.ipsa.fr](http://www.ipsa.fr)



### ABOUT IONIS EDUCATION GROUP

Created in 1980 by Marc Sellam, the IONIS Education Group is the first group of private, higher education in France. The 25 schools and entities of the Group bring together nearly 28,500 students and 75,000 alumni in the fields of business, marketing, communication, management, finance, information technology, digital, aerospace, energy, transport, biotechnology and innovation. The self-defined mission of the IONIS Group is to bring forth new business intelligence today and tomorrow. In 2017, the IONIS Group is expanding its borders with the creation of interdisciplinary urban campuses in foreign metropolises (Barcelona, Berlin, Brussels, Geneva and soon New York City). Strong international scope, attachment to innovation, entrepreneurial spirit, and veritable “culture of adaptability and change”, these are the main values taught to the future alumni of the IONIS Group - key actors in tomorrow’s economy.