

MSc IN DATA SCIENCES & BUSINESS ANALYTICS



CentraleSupélec Institute of Science & Technology

CentraleSupélec is the result of the merger of the École Centrale Paris and Supélec in January, 2015. Since 2009, the two Institutes have progressively strengthened their partnership and collaboration, bringing together all of their activities (engineering education, research and post graduate programs) under the core values of excellence, innovation, entrepreneurship, internationalization and leadership.

CentraleSupélec has 4,700 students, of whom 3,500 are engineering students, 30% are international students, 600 PhD candidates, 18 research departments or teams, 176 partner universities in 45 countries, 140 corporate partners and 35,000 alumni working in all economic sectors worldwide.

CentraleSupélec offers the best of engineering education and research.

International Rankings



A French and international Network

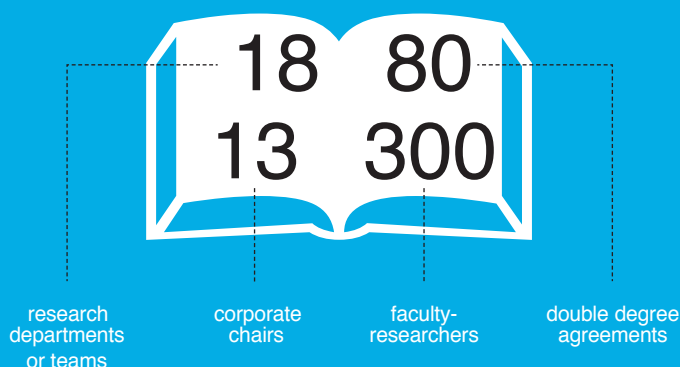
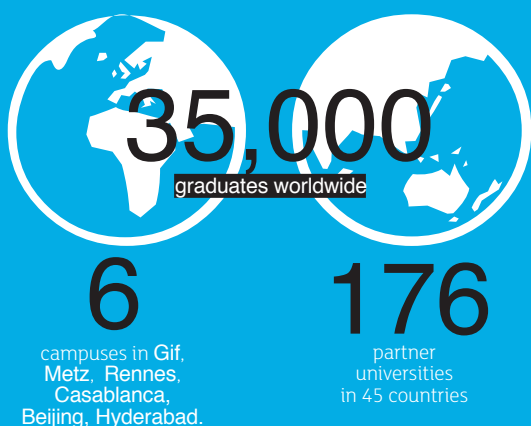
CentraleSupélec has 3 campuses in France and 3 campuses abroad: in China with École Centrale Beijing, India with Mahindra École Centrale in Hyderabad and Morocco with École Centrale Casablanca. CentraleSupélec's aim is to be at the "heart" of a worldwide network of interconnected organizations, in developed and emerging countries, within which professors, researchers and students will circulate.

École Centrale Group

CentraleSupélec leads the École Centrale Group. Together with École Centrale Lyon, École Centrale Lille, École Centrale Nantes and École Centrale Marseille, all located in France. CentraleSupélec develops international research and academic partnerships and exchanges, mostly in Europe, South-America and Asia.

Université Paris-Saclay

CentraleSupélec is a founding member of Université Paris-Saclay: the Institute has greatly contributed to the definition of the "Saclay Campus" project and its branding as an Initiative of Excellence (IdEx), contributing to the stature of Université Paris-Saclay becoming its School of Engineering. This provides a unique opportunity for CentraleSupélec to access a scientific environment of international standing, along with exceptional worldwide visibility and positioning.



Message from the Deans



The digital revolution is currently transforming the world as we know it: disrupting all of our ingrained habits and opening up new domains of which we cannot yet grasp their full extent. Therefore, in this digital age, processing vast quantities of data has become a major issue for companies and for society as a whole. This digital frontier offers an incredible opportunity for young graduates who are in a unique position to blend technological, managerial and cross-cultural savoir-faire.

In order to train the 'digital architects' who will be able to seize this opportunity, ESSEC and CentraleSupélec have joined forces to develop a radically original program: the MSc in Data Science & Business Analytics. This program is part of a major alliance between two world-renowned institutions, which share the same passion for excellence and a willingness to anticipate the needs and challenges of the future.



With this program, we offer ambitious students a unique experience thanks to the professors at our two institutions who are recognized for their expertise, their excellent research and in particular for their ability to build and transmit cutting-edge knowledge.

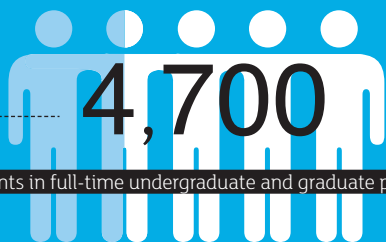
Becoming an MSc in Data Science & Business Analytics student will give you the chance to succeed in the rapidly evolving 21st century; in a world both complex and uncertain where the control of data becomes an invaluable asset to opening a number of doors.

Do you share our pioneering vision?

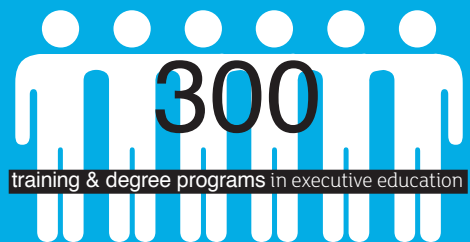
Enroll in the ESSEC CentraleSupélec MSc in Data Sciences & Business Analytics program.

Prof. Jean-Michel Blanquer
Dean and President, ESSEC Business School

Hervé Biais
Dean and President, CentraleSupélec



30% — 70 — +150
international students nationalities represented student organizations



+140
partner companies in education and recruitment

The core of business decisions

Society has entered a new digital era where the creation, consumption and use of digital content have changed our lives. The proliferation of sensors, the internet of things, digital services and communication continuously produce highly heterogeneous, highly unstructured and high dimensional data hardly interpretable from human intelligence.

Reasoning from and mining this data constitutes a novel way to think out of the box, analyze, address unsolved problems and obtain new solutions. It provides a wealth creation engine through the introduction of novel practices, services and policies. The future of business intelligence therefore relies jointly on mastering the science of data and the techniques of business analytics which have become the pillars of such interdisciplinary efforts.

An intelligent use of data nowadays forms the core of business decisions and constitutes the driving force of the societal and economic evolution of the years to come. It is probably one of the most important topics of our days. Analysts estimate that data-related businesses generated about 10 billion dollars in recent years, and will probably generate more than 30 billion dollars in the years to come.

The growth in job opportunities is tremendous: companies and organizations will need a couple of hundred thousand data scientists and business analytics leaders in the next few years. Moreover, the exponential growth in content generation will bring about a huge need for highly qualified individuals with an in-depth knowledge and a global understanding of the technological and business challenges underlying the digital evolution era.

Recent business studies converge to an estimated need of educating several million data scientists and leaders within the decade to come. This is why two prestigious French Grandes Ecoles ESSEC Business School and CentraleSupélec have partnered to propose this very innovative and complete program. We believe that truly innovative leaders must be both business savvy and erudite in data sciences. Hence we propose a unique program where students learn and combine the key skills in innovation and wealth creation that companies will increasingly require.



Guillaume Chevillon
Academic Co-Director,
Professor of Econometrics
& Statistics,
ESSEC Business School



Nikos Paragios
Academic Co-Director,
Professor of Applied
Mathematics
& Computer Science,
CentraleSupélec

An Alliance of excellence

ESSEC & CentraleSupélec Savoir-Faire

Expertise in Data Sciences

CentraleSupélec -established in 1829- has developed a data sciences program that lies on the intersection of mathematics and computer science seeking mathematical models and their computational solutions towards automatic structuring, interpretation and understanding of massive (visual) data with emphasis on machine learning, optimization, computer vision and biomedical image analysis.

Expertise in Business Analytics

For over forty years, ESSEC has been a pioneer in the development of a scientific approach to management. ESSEC -established in 1907- has trained generations of students, fostered research and helped firms develop and prosper.

Recently ESSEC Business School created several Centers of Excellence to further enhance its production of knowledge and solutions. Students therefore have access to a wide range of conferences and interactions with practitioners and researchers from the different sectors. The MSc in Data Sciences & Business Analytics is particularly involved with the three Centers of Excellence: Digital Business; Impact Entrepreneurship and Smart Life.

The program is in particular closely involved in ESSEC's Strategic Business Analytics Chair with Accenture. During their studies, students can apply to the Chair and participate in their activities.

A SHORT FLEXIBLE CURRICULUM

- Awarded by 2 prestigious French Grandes Ecoles
- Intensive full-time program
 - Courses & International Field Trip (10 months)
 - Internship & Thesis (4 to 6 months)
- 90 ECTS credits
- Intake in September
- Est. 2014

TAILORED TO INDIVIDUAL NEEDS & GOALS



"The courses taught us state-of-the-art techniques to solve complex business issues and at the same time we also learned how to communicate the solutions to the stakeholders with ease."

Niket, current student

An innovative & complete program

To ensure an intelligent use of data

FOR A GLOBAL UNDERSTANDING OF THE TECHNOLOGICAL AND BUSINESS CHALLENGES UNDERLYING THE DIGITAL EVOLUTION ERA AND TO MASTER THE SCIENCE OF DATA AND THE TECHNIQUES OF BUSINESS ANALYTICS, THE PROGRAM HAS A STRONG ANALYTICAL FOCUS AND AIMS TO PROVIDE STUDENTS WITH A COMPREHENSIVE VIEW OF THESE TWO COMPLIMENTARY AND INTRINSICALLY LINKED FIELDS ENABLING THEM TO DEVELOP AND BECOME FULLY-OPERATIONAL PROFESSIONALS. THE PROGRAM TAKES PLACE BOTH ON THE ESSEC CAMPUS AND ON THE CENTRALESUPÉLEC CAMPUS, IN FRANCE (PARIS AREA).

Foundations Refresher & Core Courses

As students come from different academic backgrounds, it is important to get everybody up to speed and on the same level. To do so, in September students will take several refresher courses from the following: Contemporary Economic Challenges, Negotiation, Financial Accounting, Intercultural Management, Statistical Methods, Mathematics and Coding. They will study on both campuses: ESSEC and CentraleSupélec.

Program outline

1st Period

Refresher & Core Courses
At ESSEC Business School & at CentraleSupélec

2nd Period

- At least 6 electives to choose from
- Data Sciences (DS) at CentraleSupélec
- Business Analytics (BA) at ESSEC Business School with a minimum of 2 in either field. Possibility to Major in DS or BA by validating 4 courses in the field.
- International Field Trip

3rd Period

- Internship & Thesis



From October to December students must attend six core courses.

3 core courses are offered at the ESSEC Business School campus

► **Big Data Analytics**

Dealing with statistical methods for the analysis of multidimensional data, this course aims to develop analytical problem-solving skills while presenting quantitative methods apt to support decision-making processes in the face of uncertainty. It also provides actionable tools to analyze and leverage data (PCA, regressions, decision trees, clustering, data and text mining).

► **Strategic Business Analytics**

This course aims to help students use quantitative techniques in a strategic consulting approach in order for them to be able to design, assess and manage business strategies. It is based on real life cases and will give students prerequisites on how to build a strategy and how to present it to different types of audience and stakeholders.

► **Forecasting & Predictive Analytics**

With a focus on forecasting methods used in business and economics, this course develops students' judgment and critical sense in order to be able to produce and evaluate operational forecasts by understanding how forecasting is possible, and how it can go wrong. These practical analytical skills will equip them with a competitive edge.



Data Sciences & Business Analytics:

A novel way to think out of the box

3 core courses are offered at the CentraleSupélec campus

► **Continuous & Discrete Optimization**

Programming exercises in Python are covered in this course as well as the basic theory and methods for the solution of optimization problems; iterative techniques for unconstrained minimization; linear and nonlinear programming as well as discrete methods for engineering applications.

► **Machine Learning**

An overview of the most important trends in machine learning, with a particular focus on statistical risk and its minimization with respect to a prediction function is given in this course. A substantial lab section involves group projects on data science competitions and gives students the ability to apply the course theory to real-world problems.

► **Big Data Algorithms, Techniques & Platforms**

This course teaches about big data management - algorithms, techniques and tools needed to support big data processing - as storage, organization, and processing of data at a scale and efficiency goes well beyond the capabilities of conventional information technologies.

Data Sciences & Business Analytics:

The driving force of the evolution of society and the economy

Tailor the program to your goals

The program is a hybrid between Data Sciences & Business Analytics where electives are tailored to each student's specific career goal. These excellence elective courses are highly specialized in content and address recent trends and challenges.

Students must choose at least six elective courses (from January to June), with at least two in both Data Sciences and Business Analytics.

Students can choose a curriculum that is balanced across both fields. They can also choose to Major in Data Sciences or Business Analytics by validating four elective courses in this field.

8 elective courses in Data Sciences are offered at the CentraleSupélec campus

► Massive Data Processing

This course tackles the analysis of massive data sets that are generated in many scientific and business intelligence applications. Given the scale and speed of data that needs to be processed, Big Data challenges the state of art machine learning algorithms and for this reason there is an ongoing effort to design learning algorithms to accommodate a parallel/distributed or even a streaming evaluation.

► Advanced Machine Learning

The importance of information theory towards understanding the underlying concepts of machine learning problems is studied in this course. It will also investigate the use of modern exploration strategies towards predictive/recommendation systems, generation and compression.

► Natural Language Processing

This course aims to present a fairly broad graduate-level introduction to computational linguistics, the study of computing systems that can process, understand, or communicate in human language. The primary focus of the course will be on understanding various NLP tasks, algorithms for effectively solving these problems, and methods for evaluating their performance.

► Sparse Coding & Compressed Sensing

An introduction to the mathematical concepts and techniques will be covered in order to achieve a solid understanding of the fundamental principles of signal processing, sparse coding and optimization. We will focus on providing a short overview of the most recent methods both in terms of representations (scarcity/compressed sensing and coding) as well as in terms of representations and inference including continuous and discrete optimization.

► Geometric Methods in Data Analytics

The fundamental constructions related to the manipulation of complex phenomena are reviewed in this course, mixing ideas from computational geometry and topology, statistics, and machine learning. Data analysis is the process of cleaning, transforming, modeling or comparing data, in order to infer useful information and gain insights into such phenomena.

► Distributed Optimization & Computing

The objective of this course is to introduce the theoretical background which makes it possible to develop efficient algorithms to successfully address these problems by taking advantage of modern multicore or distributed computing architectures. This course will be mainly focused on nonlinear optimization tools for dealing with convex problems.

► Deep Learning & Convolutional Networks

In this course, we will discuss the motivations and principles regarding learning algorithms for deep architectures, starting from the unsupervised learning of single-layer models such as Restricted Boltzmann Machines, and moving on to learning deeper models such as Deep Belief Networks. The advent of big data and powerful computers has made deep learning algorithms the current method of choice for a host of machine learning problems.

► High Performance and Parallel Computing

The most modern and efficient tools in terms of distributed and parallel computing will be presented in this course. The content refers to both the underlying theoretical foundations of distributed programming as well as the practical use of existing distributed programming architectures able to accommodate asynchronous flow of high dimensional/heterogeneous data.





"I learned a great deal about business analysis while following courses taught in Business Analytics at ESSEC. Working on this topic in some research projects put my knowledge into business perspectives. It helped me learn the science of numeric analysis and the arts of precise communication associated with it; the latter being so crucial yet often being ignored in business context. I am sure that the acquired knowledge and skills helped me achieve professional success."

Avijit, ESSEC Graduate
Strategic Performance Manager at GlaxoSmithKline

8 elective courses in Business Analytics are offered at the ESSEC Business School campus

► **Quantitative Risk Management**

So that students acquire the practical tools to solve real problems, this course builds upon the main theoretical concepts and modeling techniques of Quantitative Risk Management. Main concepts include loss distributions, risk measures, interdependence and concentration of (extreme) risks, using techniques deriving from probabilistic modeling and statistical analysis, etc.

► **E-Business Strategy & Operations**

With a managerial rather than a technical approach, this course provides participants with the knowledge needed to participate in and manage the development of e-business websites. It aims to help students understand the strategies, tactics and processes involved as well as give them the knowledge and competencies to be able to interact effectively with development professionals.

► **Supply Chain Analytics & Tools**

This course has two main objectives: to familiarize students with the core designing, planning and optimization tasks of a supply chain manager, and to introduce students to the use of supply chain applications to solve the most prominent problems. Course participants study and apply the latest methods that are used to solve supply-chain related tasks.

► **Business Intelligence**

In order to gain insight and make better decisions, this course refers to the technologies and processes for collecting, blending, modeling, analyzing and visualizing data. It presents information systems and technologies used in decision making, as well as BI-specific modeling techniques. The ultimate aim of the course is to arm students with the knowledge and skills pertaining to the use of IT for decision making.

► **Econometrics**

By introducing the basic concepts of econometrics and modeling approaches, this course will ensure students are able to: implement suitable statistical methods for the construction of econometric models, assess the validity of econometric models and use econometric software. The assimilation of the concepts of the course, learning tools and modeling approaches will be based on examples in the fields of finance, insurance, marketing, etc.

► **Marketing Analytics**

This course exposes students to the application and presentation of analytical and statistical methods to solve marketing problems, especially as they relate to customer description, targeting, lifetime value, customer relationship management and optimization of marketing actions and tactics (targeting and campaigns). The students work on data from direct marketing, database marketing and interactive marketing among others.

► **Case Studies in Business Analytics with Accenture**

Worldwide experts from Accenture present actual projects and deliverables in their field of specialty, walk the students through their analysis, and present them with interactive case studies. This course therefore gives students perspective into the different sectors analytics is used in.

► **Case Studies in Predictive Analytics with SAS**

The skills required for analyzing data and assembling analysis flow diagrams using the tool set of SAS Enterprise Miner for both predictive modeling (decision tree, regression and neural network models) and pattern discovery (segmentation and sequence analysis) will be discovered during this course.





Pedagogical approach focused on learning by doing

The program relies on a wide range of teaching methods including lectures, current events, case study analysis, in-class exercises as well as extras throughout the year.

Masterclasses

Students will attend a series of masterclasses on trending, varied and useful topics such as Artificial Intelligence, Data Visualization, Data Ethics & Regulation, Management Consulting, Health & Biosciences, e-Entrepreneurship and Information Governance.

International Field Trip

The one-week international field trip provides opportunities to meet local professionals and business leaders. Students may travel to Hong Kong, Silicon Valley etc.

The internship

The internship, with duration of 4 to 6 months, can take place anywhere in the world and is designed to facilitate students' professional integration. It enables them to apply their newly acquired skills and knowledge to hands-on-experience as interns within an organization. Students find them easily via the extensive ESSEC Business School and CentraleSupélec networks.

The thesis

The MSc thesis represents an independent and individual research on a cutting-edge topic related to data sciences and business analytics. Its objective is to provide students with a first complete and original applied or theoretical research experience in relation to their internship.



The faculty

Blending academic and professional excellence, expertise and experience

IN ADDITION TO THE FACULTY OF ESSEC BUSINESS SCHOOL AND CENTRALESUPÉLEC CHARACTERIZED BY ACADEMIC EXCELLENCE, A GLOBAL FRAME OF MIND AND INSTRUCTIONAL CREATIVITY, THE PROGRAM ALSO RELIES ON HIGH PROFESSIONAL PROFILES THAT BRING THEIR EXPERTISE TO THE CLASS.

Some of the program's permanent professors:

Chloé-Agathe Azencott	French	PhD in Computer Science UC Irvine, Irvine, CA (United States)	Researcher ARMINES/Mines ParisTech
Frédéric Cazals	French	Ph.D. in Theoretical Computer Science, Université Paris Diderot – Paris 7 (France)	Professor, Applied Mathematics Department, CentraleSupélec
Kevin Bretonnel Cohen	American	PhD from CU Boulder	Director, Biomedical Text Mining Group Computational Bioscience Program University of Colorado School of Medicine
Arnaud De Bruyn	Belgian	Ph.D. in Business Administration, Pennsylvania State University (USA)	Professor, Marketing Department, ESSEC Business School
Jean-Christophe Pesquet	French	Doctorate in Adaptive Methods in Predictive Coding of Digital Images, Université Paris-Sud (France)	Professor, Applied Mathematics Department, CentraleSupélec
Nicolas Glady	Belgian	Ph.D. in Applied Economics, KU Leuven (Belgium)	Professor, Marketing Department, ESSEC Business School
Marie Kratz	French	Doctorate in Applied Mathematics, UPMC Paris VI (France)	Professor, Information Systems, Decision Sciences and Statistics Department, ESSEC Business School
Felix Papier	German	Ph.D. in Operations Research, University of Cologne (Germany)	Associate Professor, Operation Management Department, ESSEC Business School
Nikos Paragios	Greek	Ph.D. in Electrical & Computer Engineering, Inria Sophia Antipolis (France)	Professor, Applied Mathematics Department, CentraleSupélec
Frédéric Pascal	French	Ph.D. in Signal Processing, Université Paris-Ouest Nanterre-La-Défense (France)	Professor, Applied Mathematics Department, CentraleSupélec
Nicolas Prat	French	Doctorate in Information Systems, Université Paris-Dauphine (France)	Associate Professor, Information Systems, Decision Sciences and Statistics Department, ESSEC Business School
Jeroen Rombouts	Belgian	Ph.D. in Econometrics, UCL (Belgium)	Professor, Information Systems, Decision Sciences and Statistics Department, ESSEC Business School

Helping you get started

47,000

ESSEC Business School alumni

35,000

CentraleSupélec alumni

2 Powerful worldwide networks

Enrolling in the MSc in Data Sciences & Business Analytics makes you a member of both the ESSEC Business School and the CentraleSupélec global alumni communities.

As a student and graduate you are able to leverage this significant network as alumni stay involved and in touch with each other and the schools. As well as sharing their experience with students, they also organize all over the world via the various local chapters, conferences, round tables, brainstorming sessions, get-togethers, etc.

“

“Alumni network is very active. It is a great advantage to be able to contact the right people in a company.”

**Regis, ESSEC Graduate
Software Engineer at Vision Objects**



© Sergey Nivens

Career services support

ESSEC Business School provides ongoing career guidance and support to students and graduates in order to help them find and pursue their chosen dream career:

- Interview and CV workshops as well as individual career orientation and guidance.
- Recruitment fairs with around 200 corporate partners from the business world, focused on a certain sector or career aspiration i.e. working in consulting or working for an international company.
- Regular meet-and-greets with businesses (CEOs / HR managers, founding partners, etc.).
- Career Portal: 6,000 job offers posted online each year and 21,000 internship offers the world over as well as international volunteer posts “VIE” (available to EU citizens under 28 years old).
- Online student CVs made readily accessible to hiring companies (some 2,500 per year).

CentraleSupélec also accompanies students and graduates on their path to success by providing the above services as well as annual recruitment fairs in London and Shanghai, in cooperation with ESSEC.

Find the right career

The growth in job opportunities is tremendous

Where the degree can take you

These two fields of expertise are complimentary, intrinsically linked and key to understanding the opportunities that come with this surge of big data.

- **Business Analysts** focus on business applications and are called upon by companies to identify challenges and evaluate risk.
- **Data Scientists** on the other hand focus more on computer science and are involved therefore in creating solutions to the problems at hand. HBR moreover crowned data scientist as the sexiest job of the 21st century.

As business analytics and data sciences are widely applied across the business world, there is a growing demand for data-driven leadership in every industry and from start-ups to huge multinationals.

With the digital age, it is no longer only internet pure players who are faced with a growing amount of data produced by daily operations. Indeed, all companies have understood that they need to act so as not to lose their competitive edge and are therefore contending to hire these profiles.

HIGH LEVEL POSITIONS IN A WIDE RANGE OF SPHERES ANYWHERE IN THE WORLD

- | | |
|-------------------------|-------------------------|
| • Management Consulting | • Internet pure-players |
| • Insurance | • Media & IT |
| • Finance | • Automotive industries |
| • Audit | • Electronics |
| • Healthcare & Biotech | • Public Sector |
| • Consumer Goods | • Retail |
| • e-Commerce | • Manufacturing |
| • e-Business | |

RECRUITING COMPANIES

- | | |
|-------------------|---------------------|
| • Accenture | • Mars Incorporated |
| • AXA | • Mazars |
| • Bain & Company | • Orange |
| • BNP Paribas | • PwC |
| • Crédit Agricole | • Renault |
| • Deloitte | • Sagemcom |
| • Ekimetrics | • Société Générale |
| • EY | • Thales |
| • Google | • And many more... |
| • Pierre Fabre | |



Who Can Apply?

TYPICAL CLASS PROFILE

30-40 students

Average age: **24** years old

60% French students

40% international students

60% hold degrees in engineering or science

40% hold degrees in economics or management

THE MSc IN DATA SCIENCES & BUSINESS ANALYTICS IS A HIGHLY SELECTIVE PROGRAM DESIGNED FOR HIGH-POTENTIAL CANDIDATES HOLDING (OR CURRENTLY PURSUING) A STRONG BACHELOR OR A MASTER'S DEGREE IN ENGINEERING, SCIENCES, BUSINESS OR ECONOMICS.

Applicants should be academically excellent, open minded, internationally oriented, sensitive to the world around them and have leadership potential.

The selection process

Selection is based on an exceptional academic record as well as strong motivation to pursue the program.

- Online application file
- Management aptitude test is required: GMAT or GRE or TAGE MAGE
- English test is required: TOEFL, TOEIC or IELTS

The English test is not required if the applicant is an English native speaker, has spent at least 3 years in an English-medium program or has lived or worked for at least 3 years in an English speaking country.

There are 5 rounds of admissions per year, in October, January, February, April and June

More about the MSc in Data Sciences & Business Analytics

Discuss...

With an enrolled student on ESSEC/CentraleSupélec Talk.

Refer to...

News, testimonies, financing your studies, admission process and schedule.

Apply online...

www.essec.edu / www.centralesupelec.fr



Campus Life



CentraleSupélec Campuses are ideal places for studying and participating in the numerous student clubs and organizations, thus developing social relationships with people of other nationalities.

In coming to CentraleSupélec, each student participates in an exceptionally rewarding student experience, benefiting from one or more artistic, cultural, sporting or humanitarian activities. On each campus, the students will find tennis courts and sports fields, a gymnasium and areas devoted to cultural activities.



New Campus



In 2017, CentraleSupélec inaugurates its new campus of Saclay at the south of paris, with state-of-the-art facilities.



CENTRALESUPÉLEC

Gif-sur-Yvette campus

3 rue Joliot Curie
91192 Gif-sur-Yvette Cedex
France

Metz campus

2, rue Édouard Belin
57070 Metz
France

Rennes campus

Avenue de la Boulaie
35576 Cesson-Sévigné Cedex
France

CentraleSupélec Executive Education

30 rue des Favorites
75015 Paris
Tel. +(0)01 41 131 500
www.exed.centralesupelec.fr

The content of this brochure is intended for informational purpose only,
is subject to modification and is not legally binding.

www.centralesupelec.fr