

# **HUMAN AND SOCIAL SCIENCES IN THE ENGINEERING CURRICULUM OF ECOLE CENTRALE PARIS**

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CentraleSupélec

**WHO ARE WE ?**

# CENTRALESUPELEC IN SHORT

A leading European-based technology and engineering graduate and research institution, that is :

- Born officially on December 30, 2014 by French government decree as the union of formerly existing Ecole Centrale Paris (1829) and Supélec (1893), two engineering graduate 'Grande Ecole'.



- Incarnates the tradition of Excellence of French «*Grandes Ecoles*» since 1829, into its 3-Y engineering curriculum as well as Masters of research curriculum, in Training and in Research
- Nurturing high-level engineers with strong sciences base and multidisciplinary approach into top managers, company founders and experts for France, Europe and beyond

# FRENCH HIGHER EDUCATION

2,4 million HE students

11% international

## Universities

**1,450,000 students**

- including 300k sciences/techno)
- In 80 Public Univ. (Bachelor, Master, Doc)
- Top 2 in Sciences : **Paris Sud**, Paris UPMC

## Eng. Grandes Ecoles

**140,000 students**

**In 226 post-graduate engineering schools**

**Top 3 Engineering institutes :**

- Polytechnique (400 p. class)
- CentraleSupélec (1000 pc)
- Mines (80 pc)

**→ Gets best 1% of sciences & engineering graduate students**

## Technician institutes

**250,000 students**

**Technicians  
2 years training**

## Others

**460,000 students**

**Others institutions:**

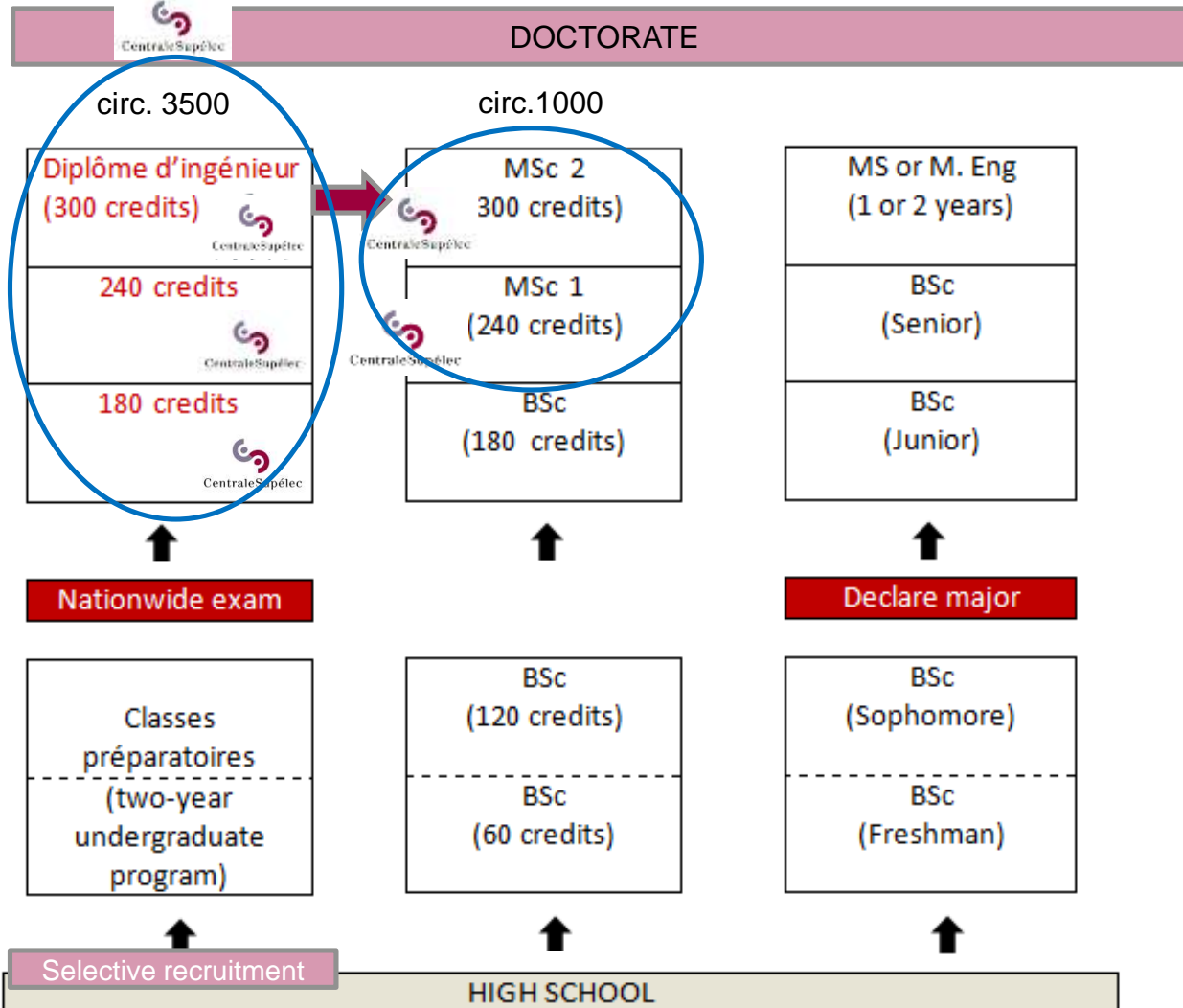
**Business and Management Schools  
Architecture  
Design, Art  
Para-méd/Pharma  
...**



CentraleSupélec

- **Highly selective entrance exam**
- **Long studies (3 to 4 years after 2 years preparatory classes)**
- **Generalist and multidisciplinary training,**
- **Strong ties to the business world**
- **International orientation**
- **High-level Research**

# A COMPARISON OF HIGHER EDUCATION SYSTEMS



# STRONG PARTNERSHIP AND INSTITUTIONAL RELATIONS WITH COMPANIES



CentraleSupélec



# STRONG NATIONAL AND INTERNATIONAL NETWORKS

3 NATIONAL CAMPUS, 3 OVERSEAS CAMPUS, 4 JOINT LABORATORIES  
5 ECOLES CENTRALES IN FRANCE



FRANCE



CHINA



MOROCCO



INDIA



SINGAPORE  
NUS

LIA2MSC  
BEIJING, CHINA



GT Lorraine / CNRS/ CS  
France / USA



# STRONG COMMITMENT IN

université  
PARIS-SACLAY

By **2025, 18 institutions** will have moved to Saclay to form one of the main player in HE and Research in Europe :

- 60 000 students
- Including 10 000 Masters and 5700 PhD (40% international)
- 10 500 researchers
- 73 ERC grants, 6 Fields medals and 2 Nobel prizes
- 8 000 publications per year
- 18 Doctoral Schools







# **HUMAN AND SOCIAL SCIENCES IN THE ENGINEERING CURRICULUM OF ECOLE CENTRALE PARIS**

# HUMAN AND SOCIAL SCIENCES IN THE ENGINEERING CURRICULUM OF ECOLE CENTRALE PARIS : WHY ?

## FIVE MAJOR REASONS :

### 1°The **Culture** of the School

Founded in 1829 on a private initiative of young disciples of the Earl of Saint-Simon (1760-1825) :

- The utopia of the Earl of Saint-Simon

⇒ **Humanist values**

⇒ **Among which social responsibility of leaders**

### 2°Since its foundation, Centrale Paris has been and continues to be a so-called « **generalist** » School of Engineering :

- Concept inherited from our founders
- from « the whole spectrum of engineering sciences »...
- ...to « all the aspects of an actual industrial problem »...
- ... and more « all the aspects of a company problem »

⇒ **Systemic approach of problems...**

⇒ **... including economical, environmental, ethic, social, political...and therefore human and social aspects**

# HUMAN AND SOCIAL SCIENCES IN THE ENGINEERING CURRICULUM OF ECOLE CENTRALE PARIS : WHY ?

3° More and more, **engineering profession implies human relation abilities** :

- With more and more partners and contributors
  - In more and more complex situations and networks
- ⇒ **Teamwork, multicultural environment, complexity,...**
- ⇒ **A good general culture**

4° Professional legitimacy of engineers is initially based on technical competence,

**The success of a professional career is based on human qualities, and especially ability to communicate**

# HUMAN AND SOCIAL SCIENCES IN THE ENGINEERING CURRICULUM OF ECOLE CENTRALE PARIS : WHY ?

5° At Ecole Centrale, we don't educate engineers : **we educate persons, who are not yet completely adults!**

- Of course we give to our students an excellent and very ambitious engineering education.
- But the main issue of the School is :

*« To help each student to find a greater coherency between what he/she is or will be as a person, a citizen and a professional »*

*Even if his/her project is not to be an engineer.*

- ⇒ *The School encourages and supports every project or proposal of a student which is considered as positive for him/her*
- ⇒ *even if it requires adaptations of his/her cursus*

# FIRST PERIOD : END OF THE 20th CENTURY



CentraleSupélec

- The driving force came from **the development of international programs of the School :**
    - Centrale Paris « invented » the double degree in 1986
    - Development of
      - the double-degree
      - the T.I.M.E. network
  - **Soon, it appeared that one of the major interests of double degree, with a long stay, is the cultural one :**
    - to live 1,5 or 2 years abroad
    - and to be imerged in a different culture, helps our students
    - to understand better their own culture
    - and to be more aware of it.
- ⇒ **It improves drastically their capacities to adapt in any situation, to communicate and to understand better the World.**
- ⇒ **To get full benefit of their international experience, our students must develop their knowledge of their own culture.**

# FIRST PERIOD : END OF THE 20th CENTURY

## THREE MAJOR INITIATIVES

### 1° The « AOC » (**Cultural Openness Activities**)

- A very large spectrum of modules
  - from « what is psychoanalysis ? » to « italian painting of the Middle Ages »...
  - through « basics of organizations sociology » or « Spinoza philosophy » etc...etc...
- Delivered by external experts or professionnals
- Chosen by the students (30h each module, at least one/year)
- More discovery activities and conferences than actual courses

- ⇒ **+ acceptance of soft skills importance and HSS as a discipline by the stem professors**
- ⇒ **+ satisfaction of a large majority of students**
- ⇒ **- lack of ambition : comprehension of the HSS methods ?**
- ⇒ **- does it really improve the openness of the students ???**



# FIRST PERIOD : END OF THE 20th CENTURY

## THREE MAJOR INITIATIVES

### 2° The revamping of the french test of the entrance national competitive examination

- Importance of the mastery of french language
- Traditionnally, a dissertation on a sentence of a writer or a philosopher

⇒ A new test **with an higher coefficient than the 2<sup>nd</sup> test of mathematics**

⇒ Based on a « long text» (>1500 mots) and with two parts :

- A contraction of this text to exactly 300 words
- A dissertation on a sentence of the text but which must take into account the context defined by the text

⇒ **Ability to understand deeply a text, to use french efficiently and proper words either to synthesize or to analyze**

⇒ **+ a good preparation and a good filter**

⇒ **- but not sufficient to insure a very good level**

# FIRST PERIOD : END OF THE 20th CENTURY

## THREE MAJOR INITIATIVES

### 3° The development of the foreign languages offer and study

- To improve the ability of our students to communicate, to conceptualize and to understand the other cultures :
    - A very high level required in french and english
    - A certified level in a third foreign language
- ⇒ Courses structured on the cultural aspects (art, cinema, littérature, traditions, history...)
- ⇒ At least 6 monthes abroad mandatory to get the degree (mean value = 13 monthes)
- ⇒ + students and professors very satisfied
- ⇒ - some students need intense support on basics

# SECOND PERIOD : BEGINNING OF THE 21th CENTURY



CentraleSupélec

The driving force was **the complete revamping of the curriculum (2006-2010), to adapt it to the new century.**

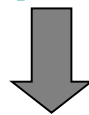
- ⇒ The « Ariane Project » : Training new “Centraliens”
- top-level multidisciplinary engineers,
  - who can effectively impact today’s world through their strong leadership, entrepreneurship and innovative spirit.

Excellent on a scientific and technical basis  
and...

«Innovative / Entrepreneurial / Leader»



Capacity to  
innovate



Ability to initiate,  
manage and  
succeed at change



Ability to deal with more  
and more complex  
interdisciplinary  
issues

## SECOND PERIOD : BEGINNING OF THE 21th CENTURY



CentraleSupélec

But the « Ariane » project was also the opportunity **to change the educational paradigm of the School :**

⇒ **From**

**« We teach Engineering Sciences  
and they are very useful  
to study and to manage Systems »**

⇒ **To**

**« We teach Systems  
and Engineering Sciences are very useful  
to study and to manage them »**

⇒ **To teach the basis of HSS became mandatory because real systems always have human and social dimensions !**

# SECOND PERIOD : BEGINNING OF THE 21th CENTURY

## THREE MAJOR INITIATIVES

### 1° The first year « 21st century challenges » project

**First step :** Placing the student, as soon as he arrives the School at the heart of the challenges of the 21st century

⇒ 7 major issues to be discovered throughout the curriculum :

- Energy
- Environment
- Health and biotechnologies
- Information and knowledge
- Territories and urban life
- Mobility
- Economic changes

through

- conferences, visits, workshops... explaining basics, problematics, challenges...
- and a project with a company client, since the very beginning of the first year

# SECOND PERIOD : BEGINNING OF THE 21th CENTURY

## THREE MAJOR INITIATIVES

**Second step : The project, directly related to one of the 7 issues**

### **Teams of 5 students**

who have never worked together before,  
including one foreign student, often not very fluent in French...

### **On a real, not well-defined, industrial problem**

### **With the support of**

An academic tutor,  
An industrial tutor,  
who are supposed to very busy persons.

### **Evaluated on**

The quality of team work,  
The methodology used to reach the solution,  
The way all the aspects of the problems have been taken into  
account : scientific, economic, environmental, human, social etc...

- ⇒ + students understand that team work is not easy and that one must spend more time to define a problem than to solve it !
- ⇒ - many excellent projects, but some teams get poor results



# SECOND PERIOD : BEGINNING OF THE 21th CENTURY

## THREE MAJOR INITIATIVES

### 2° The « Ariane workshops »

Groups of 40 students,  
6 workshops of 2,5 days,  
from semesters S1 to S3,  
with two facilitators

#### The professional project

Becoming an engineer

Professional project

Career management

#### The Engineer's Know-how

Problem solving and multidisciplinary

Teamwork

Communication

Project Management

#### Leadership and Creativity

Self awareness

Creativity

Complexity

Change management

- ⇒ + very successful
- ⇒ + now, completely adopted by the students
- ⇒ + one of the facilitators is an academic !

# SECOND PERIOD : BEGINNING OF THE 21th CENTURY

## THREE MAJOR INITIATIVES

### 3° The last year « **Professionnal Tracks** »

#### **10 technical options : 23 weeks**

- Civil Engineering
- Energy
- Environment
- Life sciences
- Operational research and industrial engineering
- Computer Science
- Applied Maths
- Mechanical engineering and aerospace
- Applied Physics
- Embedded Systems

#### **6 professional tracks : 8 weeks**

- Company start up
- Research
- Conception and industrialisation of innovative systems
- Project management
- Operations management
- Consulting and Finance

⇒ *Prepares the student to his/her integration in a company*

⇒ *Gives him/her the initial impulse for a successful career*

⇒ **+ extremely successful**

⇒ **+ completely adopted by the students and the companies**



# THIRD PERIOD : FROM 2010 TO 2015



CentraleSupélec

The driving force was... **the evolution of the Society !**

The globalization and the numerical revolution lead to :

- a « VUCA\* » World,
- with enormous global problems to solve!

⇒ *An emerging and more and more intense questioning of our students about :*

- *The meaning of their future job,*
- *And more over, the meaning of their life!*

⇒ *Creation of the « HSS Department »*

⇒ *Creation of the « Students Assistance Direction »*

\* = *Volatile, Uncertain, Complex and Ambiguous*

# THIRD PERIOD : FROM 2010 TO 2015

## THE HSS DEPARTMENT

- As the cursus proposes to our students many situations to develop their skills,
- As a better understanding of the World and the Society requires basics of HSS,

⇒ **It was time to introduce true HSS courses in the cursus !**

⇒ **Decision to stop « AOC »**

⇒ **Decision to establish a HSS Department :**

- Science, Technology and Society  
=> A course on Epistemology of Sciences
- Individual, Labour, Organization
- Art, Sciences, Design

⇒ **Cooperation with HSS institutions**

⇒ **Possibility of a double-degree : philosophy, history, political sciences, design ...**

# THIRD PERIOD : FROM 2010 TO 2015

## THE « STUDENT ASSISTANCE » DIRECTION

### To support and help students who have personal questioning or personal problems :

- not directly related to the rational of to their curriculum or of their future professional track,
- but leading to worry, malaise, anguish, depression, addiction...

### ⇒ A small group of persons (coaches, psychologists,...), listening to them :

- absolute confidentiality,
- on a voluntary basis,
- no judgment : sympathetic listening.

### ⇒ Orientation to «professionals» (doctor, psychologist, alumni, coach...), depending to what they need, and able to help them in the medium term or long term if necessary.



# AND NOW : FROM 2015 TO ...



CentraleSupélec

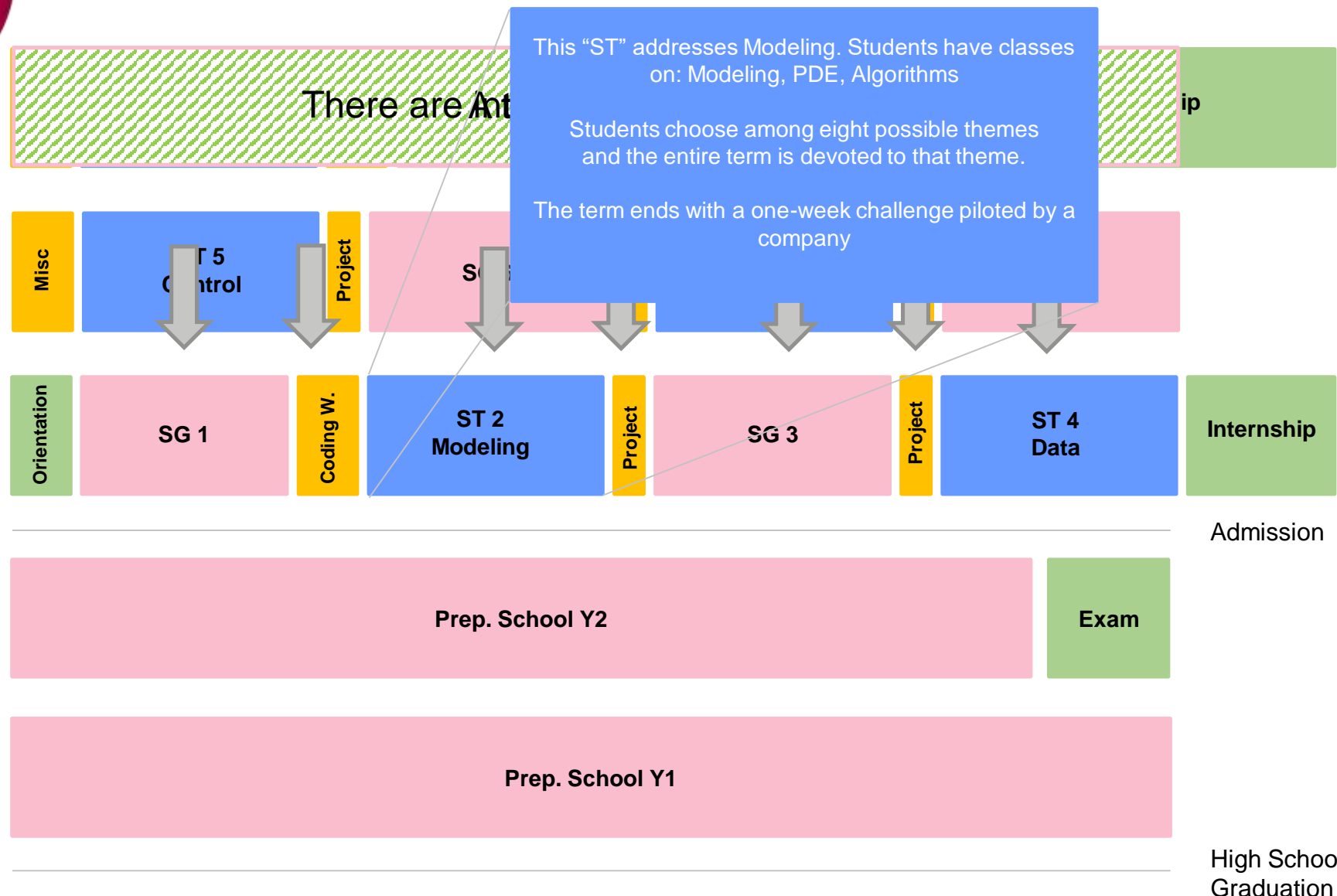
The driving force was **the conception of the new engineering curriculum of CentraleSupélec, and now, its implementation**

- Full Integration of Knowledges, Methodologies and Skills
- To face real world problems

⇒ **The generalization of the « Thematic Sequences » (« ST ») concept (successfully experimented at Centrale)**

⇒ **Maintaining all the existing successful HSS and personal development devices**





# CONCLUSION



CentraleSupélec

The progressive introduction in the curriculum of :

- skills and personal development activities,
- HSS disciplines,

has been extremely positive :

- improves the quality and the pertinence of the curriculum :
  - strongly supported by the companies,
- improves the satisfaction of the students :
  - not only students but mainly persons!
- improves the relations between the students and the faculty,
- improves the curriculum adequation with the School issue,

and therefore improves the whole School coherency, as :

*« An education institution cannot be different from what it intends to learn to its students! »*

# PERSPECTIVES



CentraleSupélec

- **HSS will be more and more mandatory in the engineering education as,**
- *in a Numerical and VUCA world,*
- *and besides the enormous 21st century challenges,*

⇒ ***Our graduates will have to face major human and social problems such like :***

- *Truth*
- *Ethics*
- *Private life*
- *Future of Democracy*
- *Future of Europe*
- *Future of Nations*
- *Religions*
- *Migrations*
- *...*

⇒ ***They have to find their solutions, but our duty is to help them as much as we can, with kindness and humility.***



# 2017 : A NEW CAMPUS IN SACLAY







CentraleSupélec

# OCTOBER 2017, 26th : THE INAUGURATION CEREMONY





**Welcome to our new Paris-Saclay Campus !  
AN EXCEPTIONAL PLACE TO LIFE AND TO STUDY**





CentraleSupélec

**THANK YOU FOR ATTENTION !**