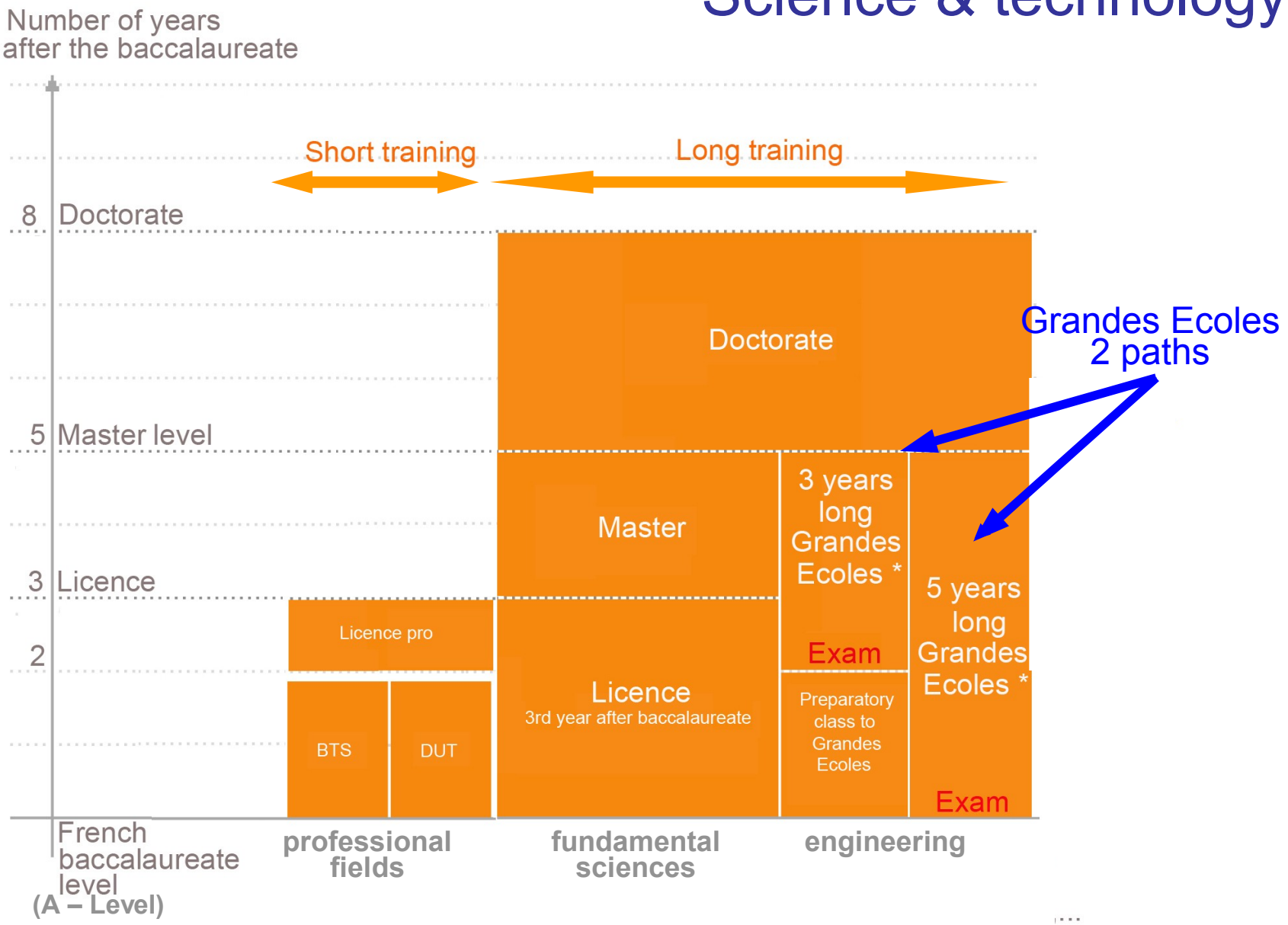
Les Écoles françaises d'ingénieurs (the French engineering schools)

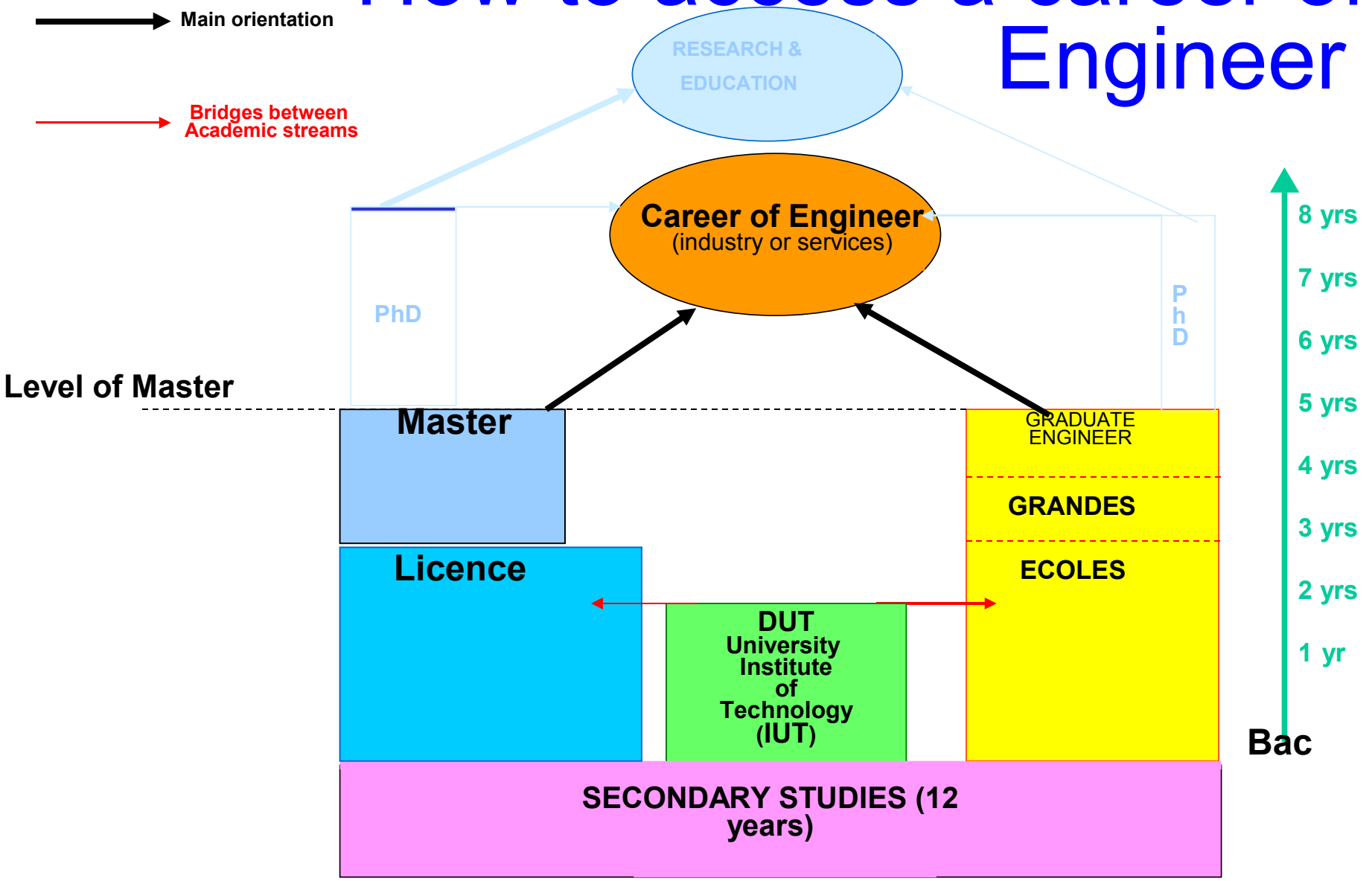
Presentation of Engineering trainings in France

Recruitment of international students and international partnerships

The French higher education system
Science & technology



How to access a career of Engineer



Key figures

- **2,2 Millions students (> 200 000 foreign students)**
- **92 Universities (all public)**
  First one created in 1272, last one some years ago
- **220 Higher Engineering Institutes**
  (« Grandes Ecoles »)
- **110 University Institutes of Technology (IUT)**
- **A National Public System**
  that guarantees the quality of education

French Engineering Schools

- **Highly selective admission process**
- **Around 30 000 “Graduate Engineers” (Ingénieurs diplômés) every year.**
- **Accreditation by the « Commission des Titres d’Ingénieurs »**
- **Autonomy in developing and adapting specific programs with**
  - **Broad basic scientific background**
  - **More than 20% of non scientific knowledge (economy, law, language, human relation…)**
  - **Mandatory and controlled level in English**
  - **Extra curriculum activities**
- **International dimension**
  - A minimal part of the curriculum must be attended abroad
  - Cooperation with foreign institutes
- **Close links between Universities and "Grandes Ecoles", specifically through common research laboratories and exchanges of professors.**

FIRST PART

PRESENTATION OF THE ENGINEERING TRANINGS IN FRANCE

AUTHORIZATION / ACCREDITATION BY THE STATE AFTER ASSESSMENT AND ADVICE BY THE "COMMISSION DES TITRES D'INGÉNIEURS" (CTI)

SECOND PART

RECRUITMENT OF INTERNATIONAL STUDENTS
AND
INTERNATIONAL PARTNERSHIPS

FIRST PART

PRESENTATION OF ENGINEERING TRAININGS IN FRANCE AUTHORIZATION / ACCREDITATION BY THE STATE AFTER ASSESSMENT AND ADVICE BY THE "COMMISSION DES TITRES D'INGÉNIEUR" (CTI)

The institutions training engineers are numerous and diverse «Grandes Écoles» (engineering schools), but they all share common values and objectives and implement a networking policy and strategy

- **The French engineering schools have various juridical status. They can be public (under the authority of different ministries) or private ; they can be within or outside the universities ; they can be universities themselves.**

- **This juridical diversity does not inhibit a great homogeneity of the training's nature, of the authorization/accreditation process and of the quality assurance, even though each institution has its own originality and autonomy.**

- **In France an engineering training is notably characterized by the following essential elements:**

I. MAIN CHARACTERISTICS OF THE TRAINING

1 . A recruitment of students-engineers based on selection:

In most cases the recruitment is based on national competitive exams, complemented by a diverse national and international offer of different routes of recognised quality.

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2 . A unique degree:

- **In France there is only one title, that of "graduate engineer" (mentioning the engineering school responsible for delivering it) which confers the grade of master recognised in the European Union.**

- **Presently about 30 000 engineer degree are delivered every year in all technical and scientific fields.**

3 . A unique duration of studies:

- **The duration of the training corresponds to a continuum of five years of higher educational studies (except for the particular case of « specialised engineer » in one year).**

- **This duration can be organised on different routes, for instance:**

***(i)* 5 years within the same engineering school;**

***(ii)* a *preparatory cycle* generally of 2 years (for instance the « preparatory classes for Grandes Ecoles », CPGE or the « integrated preparatory cycles ») within one HEI, followed by an engineer cycle of 3 years in an engineering school (Some engineering schools organise the five year duration in a one year preparatory cycle followed by a 4 year engineer training) .**

4 . A periodic assessment of the whole HEI's activities:

- **The authorization of the engineering school by the State to deliver the title of graduate engineer is awarded for a maximum duration of six years ; it must be renewed periodically after assessment of the whole engineering school's activities by a sole academic and professional national commission, applying the same criteria to all institutions. This commission is the "Commission des Titres d'Ingénieur" (CTI) which delivers an advice.**

- **The CTI (created by law in 1934), comprehends, *on par*, members proposed by the economic and industrial worlds and by the academic world, appointed by the Minister in charge of higher education ; it relies according to its needs on an group of experts.**

5 . A broad and solid scientific background and an adaptability to the jobs exercised:

Whatever the engineering school and the discipline in which the student-engineer is trained, and whatever the field in which he will exercise his vocation, the 5-year training includes four essential components:

- **The basic sciences (particularly mathematics), ensuring the future adaptability of the engineer to the evolutions of his vocation (strong characteristic of the French training).**
- **The *engineering sciences* indispensable for immediate vocational exercise.**
- **The entreprenership culture *and the comprenhension of the social, economic and human environment*.**
- **The communication skills and an international culture.**

6 – A strong participation of the Indutry… :

- **…in the *MANAGEMENT* of the HEIs :**

The engineering schools are placed under responsibility of a director and a board chaired by a personality of the economic and industrial world and in which seat representatives of the Industry (30 to 50%) as well as representatives of all the staff categories and of the students-engineer.

- **…during the *TRAINING* of the students-engineers *within the engineering schools* and *within companies*:**

An original characteristic of the training completed by a French student-engineer is the importance of the training part realised through industry placements validated by the company and the engineering school and taken into account for the awarding of the degree (generally speaking, during the last 3 years of training , 3 placements must be completed, "factory-worker internship", "study internship", "engineer internship" and/or "final project"), in order to complete the academic training.

7 . A diversified teaching body:

The academic body of lecturer-researchers is completed by experts from the economic world and from the companies.

Those must deliver a significant part of the courses.

8 – A strong link with the research structures:

- **All the engineering schools host research labs united in « Ecoles Doctorales » (doctoral schools).**

  They host (or take part in) one (or several) *Écoles Doctorales* ; Those, under control of the HEIs (universities and engineering schools), are responsible for the training of doctorate level students.

- **During his studies, the student-engineer receives a initiation to research and the title of graduate engineer permit admission to the Ecoles doctorales to prepare the *doctorate degree*.**

9 – Openness to innovation and technology transfer:

Within (or just nearby) most Engineering schools is a centre for competencies transfer towards the Industry in which the student-engineer can be sensitized to the valuation of research results and to innovation.

10 – International openness (1) :

- **It concerns activities corresponding to:**
  - **Teaching and research, notably in the domain of mobility;**
  - **The implantation of trainings abroad.**
- **The engineering schools now largely base their international activities on partneships with foreign institutions offering quality trainings in engineering. A great flexibility is observed in the content and duration of the training undertaken abroad and that offered in France.**
- **Regarding students-engineer's mobility, it concerns:**
  - **1- « outgoing » mobility;**
  - **2- « *incoming* »mobility.**

10 – International openness (2) student mobility:

1- « Outgoing » mobility of French students-engineers:

In almost every French engineering school, a student-engineer spends during his engineer cycle at least one period of studies abroad of at least 3 months, which is validated. This duration is of one year for about one third of the Ecoles.

2 – « Incoming » mobility of foreign students:

- **The average ratio of international students welcomed in a training is 15 to 20%, and up to 30 to 40% in some engineering schools.**
- **The recruitment of foreign students relies in most cases on networks of HEIs with diverse status; following exemples a), b) and c) :**

10 – International openness (3) networks:

a) Institutional Engineering schools networks made of institutions sharing common general objectives and a common policy beyond their sole international activities:

Exemples of French engineering school networks (alphabetical)

EC	Groupe des Écoles Centrale	5 Schools
ENI	Écoles Nationales d'Ingénieurs	5 Schools
ENSAM	École Nationale Supérieure d'Arts et Métiers	8 Centres
FESIA	Fédération des Écoles Supérieures d'Ingénieurs de l'Agriculture	5 Schools
FGL	Fédération Gay-Lussac	18 Schools
GEA	Groupe des Écoles de l'Aéronautique et de l'espace	4 Schools
GEM	Groupe des Écoles des Mines	7 Schools
GET	Groupe des Écoles des Télécommunications	5 Schools
INGÉFRANCE		4 Schools
INP	Instituts Nationaux Polytechniques	3 INP 20 Schools
INSA	Instituts Nationaux des Sciences Appliquées	5 Institutes
PARISTECH	Groupe des Grandes Écoles de Paris	11 Schools
POLYTECH	Écoles Polytechniques Universitaires	11 Schools
RÉSEAU AMPÈRE		6 Schools
UT	Universités de Technologie	3 Universities

10 – International openness (4) networks (continuation):

b) national networks specifically dedicated to a common international recruitment, in some cases through an online application process (« n+i » network);

c) international networks corresponding to programmes based on partnership between French and foreign institutions submitting a project to a selection committee (ex.: Brafitec network between France and Brazil).

There has been a spectacular development of actions leading to the awarding of joint-degrees over the past 5 years, especially thanks to the implementation of bilateral cooperation programmes.

10 – Internationl openness (5) abroad implantation:

Implantation of trainings abroad can cover several aspects:

- **«basic» partnership for the elaboration and implementation of teaching and research programmes, with the implication of French lecturer-researchers.**
- **«intense» partnership corresponding to deeper relations of different levels such as:**

  - an intervention based on exchanges of lecturer-researchers and students. Support of the French Ecole can be through the awarding of a label of the trainings and degrees;

  - a collaboration between a French Ecole and a foreign partner which justifies a recognition of the foreign degree by the French State;

  - a delocalisation of the French training within a foreign institution;

  - an *implantation* ex nihilo *of a French École* in a foreign country.

For each of these aspects, cases can be presented.

11 – An observatory of employment and professional insertion of the graduate engineers:

- **The responsibility of the engineering schools is naturally engaged in the follow-up of the professional insertion of their graduates and of the evolution of their careers**

- **To observe «training/employment matching», they implemented advisory boards in which seat ground experts from the companies.**

12 – A living place for the student-engineer and the graduate engineer:

- **The French engineering schools are generally rather small institutions («human size») compared to universities. This reinforced the tutoring of the students-engineers and favours their extra-curricular activities (cultural, artistic, sports as well as scientific, for instance within «junior enterprises») which they manage themselves.**

- **Regarding graduate engineers, Ecole have old and strong alumni associations which are a strong go-between for the school and the companies.**

13 – A scientific environment and a networking strategy:

- ***On the one hand,*** **the engineering schools are part of local partnerships (particularly for research) with the universities and engineering schools of their immediate environment. Furthermore they are important actors in the ongoing implementation of federative structures such as the competitiveness clusters, the thematic networks of advanced research (RTRA) and the research and higher educational regional clusters (PRES).**

- ***On the other hand,*** **they take part in local, national or international networks. If the number of accredited engineering schools in France is important (over 200), most of them are part of one of the 15 main networks (see 10 - (3)).**

II . THE «COMMISSION DES TITRES D'INGÉNIEUR» (CTI) ASSESSMENT OF THE TRAINING AUTHORIZATION/ACCREDITATION BY THE STATE

1. Composition of the CTI :

- ***32 members** appointed by the Minister in charge of higher education:*
  - *16 members coming from the socio-economic world, apointed upon proposal by the professional organisations;*
  - *16 members apointed upon proposal by the academia.*

- ***A college of national and international experts to support the activities of the members.***

2. Missions of the CTI:

The CTI…:

- **…must be consulted for all matters related to the titles of engineer;**
- ***…considers demands of authorization to deliver the title of graduate engineer*;**
- **…organises the *periodical assessments* of engineering trainings;**
- **…intervenes to inspect at any time an institution to verify the good course of the training's organisation and implementation;**
- **... opens its field of action to the international level, particularly in the frame of the construction of the European higher education space.**

3. Assessment of schools by the CTI – fields of investigation:

- ***Mission*** **and** ***organisation*** **of the institution**
- ***Openness*** **and** ***partnerships***
- ***Recruitment*** **of students-engineers**
- ***Training*** **of students- engineers**
- ***Employment*** **of graduate engineers**
- ***Quality assurance*** **and** ***continuous improvement***

4. Course of assessement and authorization:

- ***Preparatory phase:***

It is based on documents edited by the CTI (www.cti-commission.fr) which must be filled out by the institution to provide the CTI with the information regarding all domains to be assessed.

The institution is encourage to regularly implement auto-assessment now considered as a key element of a quality internal management, as well as a preparation for the external assessment. A guide for auto-assessment was edited by the CTI and the CDEFI develops a frame of reference enabling the institutions to situate their performance.

- ***Assessment phase:***

Mission of experts **on site and mission** ***report*****.**

- ***Authorization phase:***

Examination in plenary session **and transmission of the** ***advice*** **to the Ministry of Higher Educationm,along with some** ***recommandations*****.**

The authorization is granted for a ***maximum duration of 6 years*****.**

SECOND PART

THE RECRUITMENT OF FOREIGN STUDENTS AND THE DEGREES IN INTERNATIONAL PARTNERSHIP

1. General considerations:

- Various ways are open for foreign students to integrate an engineering school in France, with one of the following objective:

- validate a training period in order to continue his course of studies (credit transfer);
- obtain *a degree specifically adapted to foreign students*;
- be awarded the *title of graduate engineer*.

- Some basic principles must be reminded:

- Recruitment in French engineering schools is selective, whatever the entry level;
- The awarding of the title of graduate engineer is conditioned to the presence of the student-engineer during at least 4 semesters in the engineering school within the engineer cycle. This duration can be reduced to 3 semesters as the final project can be realised outside the school, under its control.
- The respect of these recruitment and training conditions is placed under control of the CTI.

2. *Different types of degree awarded:*

- ***Degree awarded in the standard way by only one institution:*** **in that case, the training period undertaken in a partner institution comes as a "substitution" and is validated by the institution of origin.**
- ***Joint Degree*: it is likewise a substitution process, of which the important duration and the intensity of the partnership justifies the awarding of a common degree, without extending the duration of studies.**
- ***Double-Degree:* it corresponds to a "double curriculum" which can be defined as an "addition" process as it assumes a mutual enrichment between trainings, but requires and extension of the normal training duration.**

3. *Recruitment Typology:*

- The engineering schools implement different recruitment processes:
  - either *individually*;
  - or *within national or international networks*.

- The CDEFI recommands the adoption of recruitment processes relying on strong partnerships with choosen foreign institutions able to carry-out a pre-selection of candidates; the corresponding trainings often lead to double degrees.

- This is the goal pursued by partnerships initiated by HEIs (for instance the TIME programme in Europe) or with the institutional support of the concerned countries (for instance the BRAFITEC programme between Brazil and France and similar programmes).

4. Academic recognition of training period between France and its foreign partners:

- *Government to government agreements:*

- For instance the Franco-German agreement (Weimar, 1997) establishing a correspondence framework of degrees in the scientific and technical fields;

- exemples of *ministry to ministry agreement* and *administrative agreements*:

☞ **between France et China (2003)**

☞ **between France and Vietnam (October 2004).**

- *Framework agreements between institutional association representing the HEIs (for France, CPU and CDEFI):*

☞ **Quebec (1996 et 2002), Italy (1998), Austria (2002).**

- *Agreements and conventions between HEIs:*

They are based on partnership between HEIs (mutual recognition and trust) and on their autonomy.

A RAPID OVERLOOK OF THE FRENCH « *GRANDES ÉCOLES* » TRAINING LEADING TO THE ENGINEERING DEGREE : *TITLE OF « GRADUATE ENGINEER »* (*Master's degree*)

1- ACCREDITATION / HABILITATION and PERIODICAL EVALUATION

For **ALL** institutions **ACCREDITATION** and **HABILITATION** are granted for **6 YEARS** by the government
« ***COMMISSION DES TITRES D'INGÉNIEURS*** » **CTI**
(National engineering accreditation Board composed of experts from ***Universities*** and ***Companies***)
The **CTI** is in charge of the **PERIODICAL EVALUATION** of all Engineering Schools

2- DURATION

5 YEARS after
High School degree
(« *Baccalauréat* »)

- **PREPARATORY CYCLE**
- **ENGINEERING CYCLE**

1
2
3
4
5

GRADUATE ENGINEER
(***Master's degree***)

↓

DOCTORATE
(***PhD degree***)

3- SELECTION

SELECTION AT ***EACH STAGE*** OF THE RECRUITMENT

SELECTION

COMPETITIVE NATIONAL EXAMS

« ***PARALLEL*** » ADMISSION BY SELECTION ON CURRICULUM

4- STUDIES

* BROAD **BASIC** SCIENTIFIC BACKGROUND
* **PRACTICAL** TRAINING AT THE SCHOOL AND WITHIN COMPANIES
* BASIC **DIVERSIFIED** TRAINING
* **INTERNATIONAL** DIMENSION
* **EXTRA-CURRICULAR** ACTIVITIES
* **ALUMNI**

5- STRONG CONNECTION WITH *RESEARCH, TECHNOLOGICAL TRANSFER* and *COMPANIES*

CDEFI
Conférence des Directeurs
des Écoles Françaises d'Ingénieurs