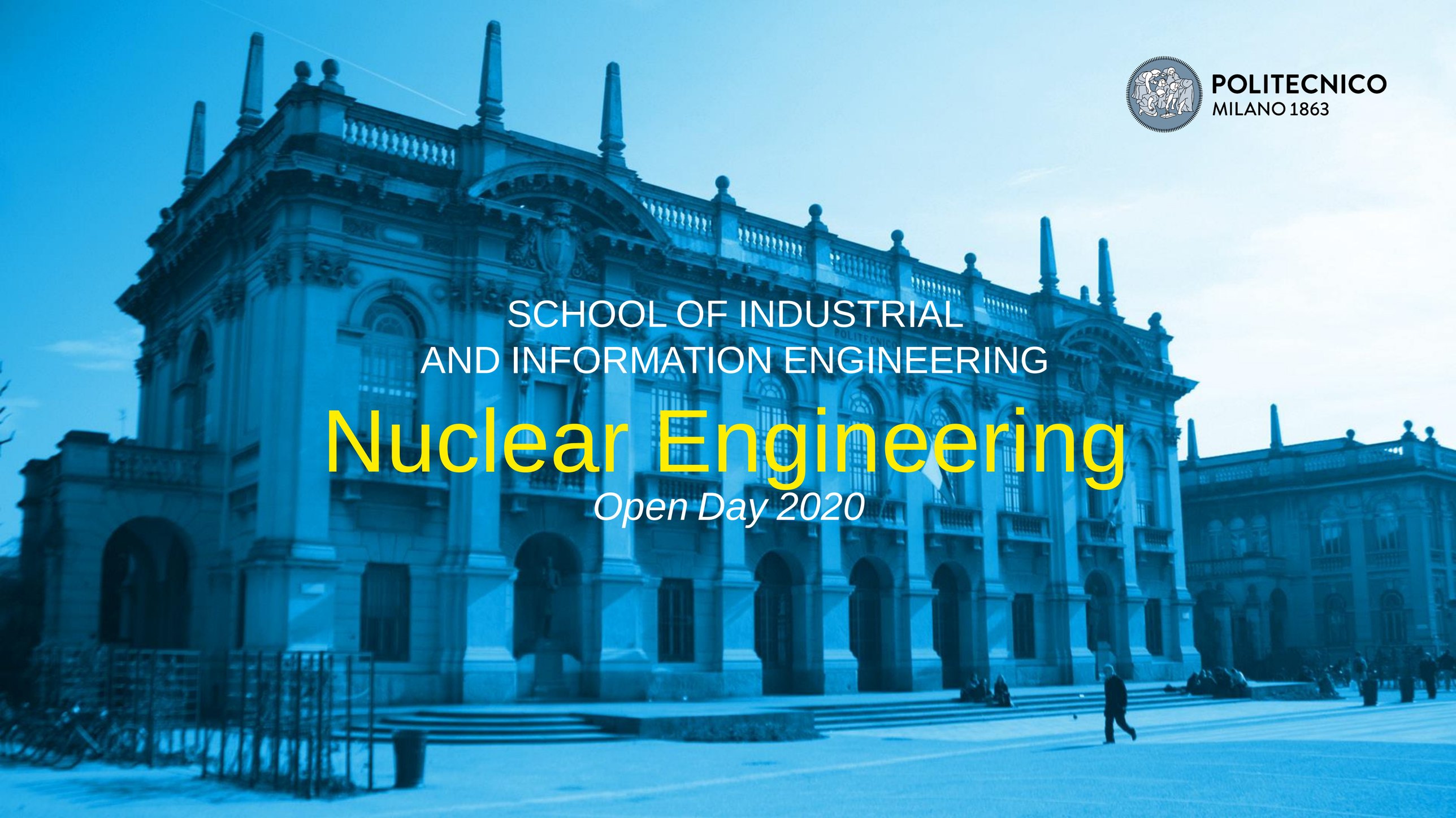


POLITECNICO
MILANO 1863

SCHOOL OF INDUSTRIAL
AND INFORMATION ENGINEERING

Nuclear Engineering

Open Day 2020

Why Nuclear Engineering?

POLITECNICO
MILANO 1863

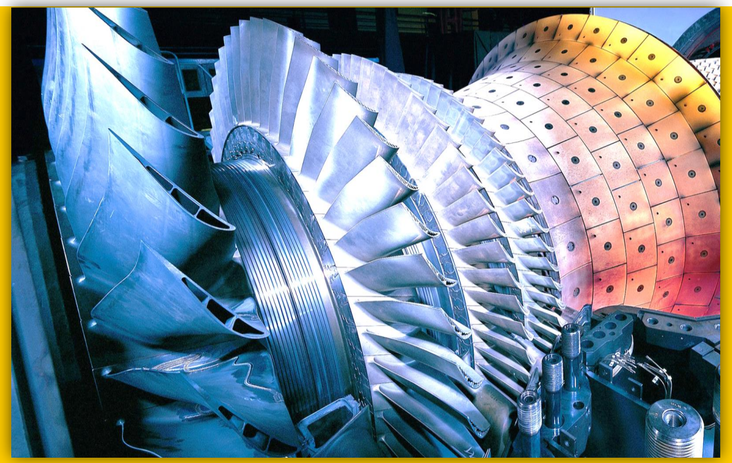
NUCLEAR CULTURE AND EXPERTISE

- NUCLEAR SCIENCE AND TECHNOLOGY
- COMPLEX PROBLEMS
- RESEARCH AND INDUSTRY

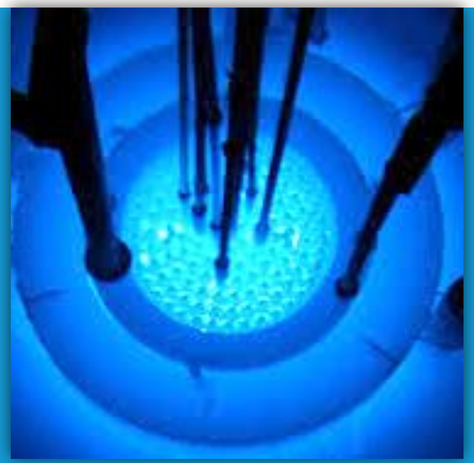
FRONTIER SCIENCE AND ENGINEERING
IN AN INTERNATIONAL CONTEXT

Who is the Nuclear Engineer?

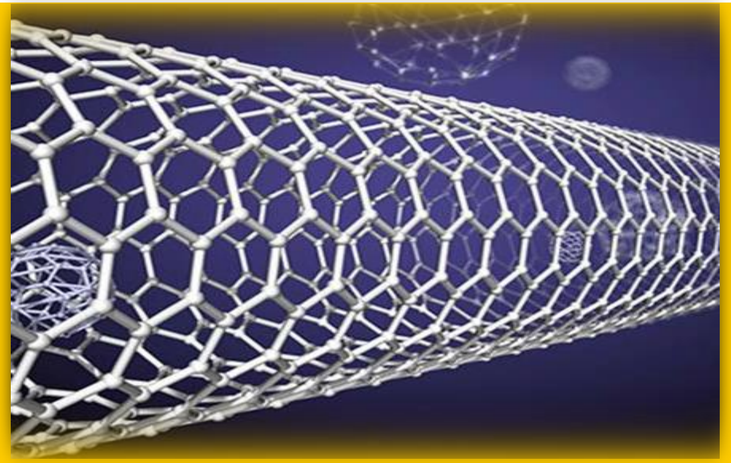
POLITECNICO
MILANO 1863

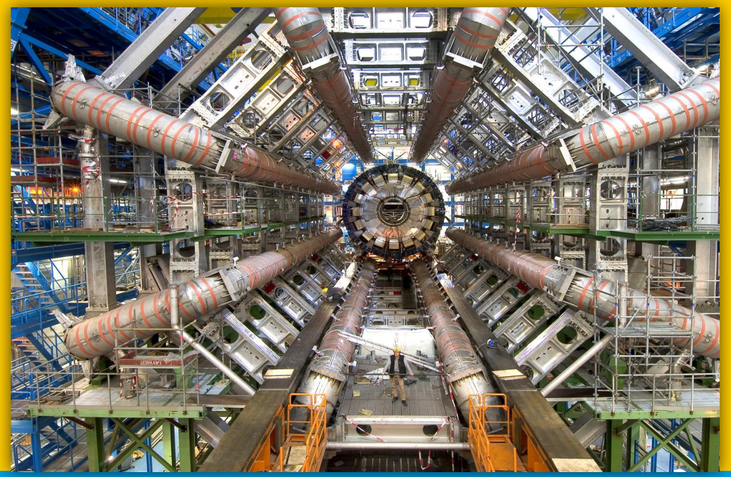


an INDUSTRIAL engineer



an expert in NUCLEAR disciplines

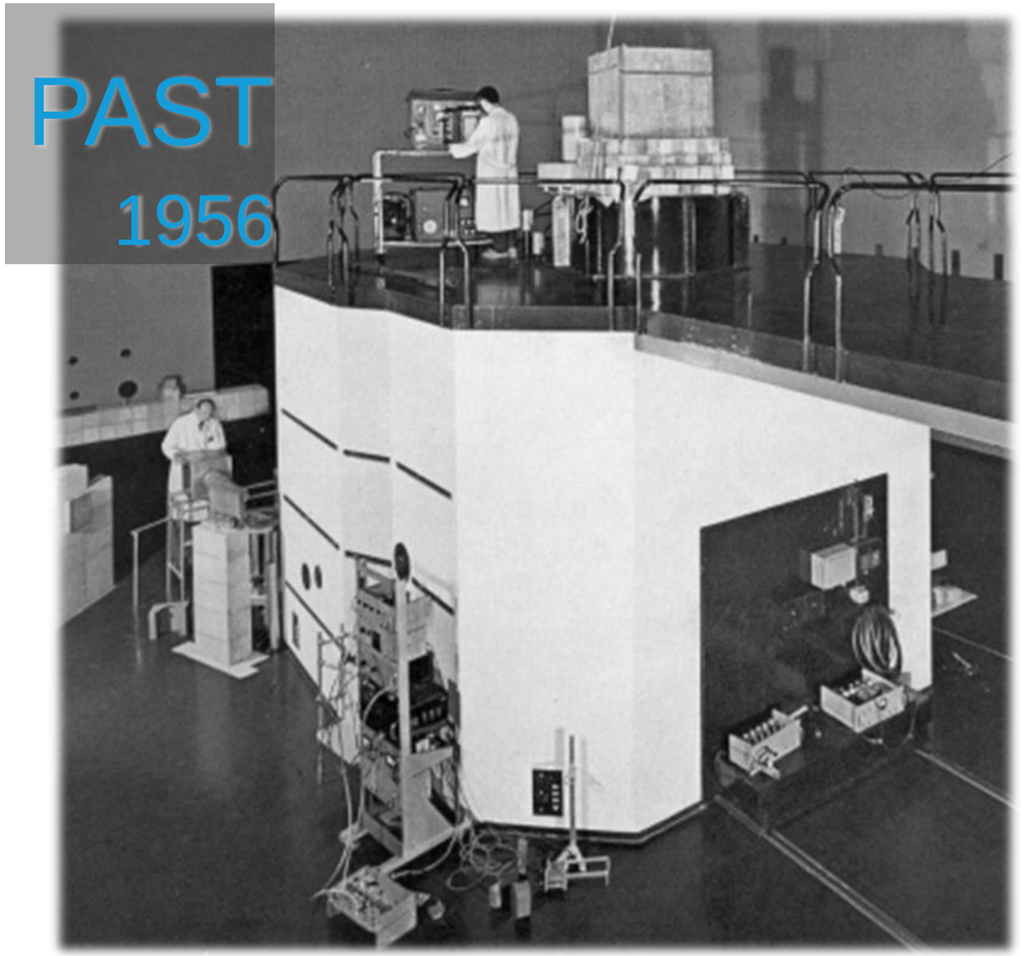




an expert in PHYSICS, ELECTRONICS, MATERIALS

At Politecnico di Milano

POLITECNICO
MILANO 1863



1st research reactor and 1st Degree Course in Italian universities

1st M.Sc. Programme in Nuclear Engineering (among the most attended in Europe)

Study plan

POLITECNICO MILANO 1863

1st YEAR M.Sc.

BASIS OF NUCLEAR ENGINEERING

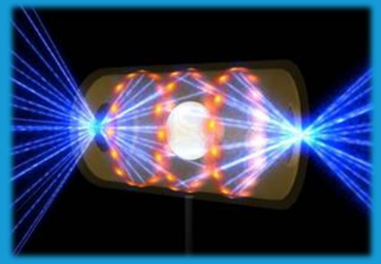
20 ECTS for completing the preparation
40 ECTS of fundamentals of Nuclear Engineering

2nd YEAR M.Sc.

NUCLEAR PLANTS

NUCLEAR TECHNOLOGIES

NUCLEAR SYSTEMS PHYSICS



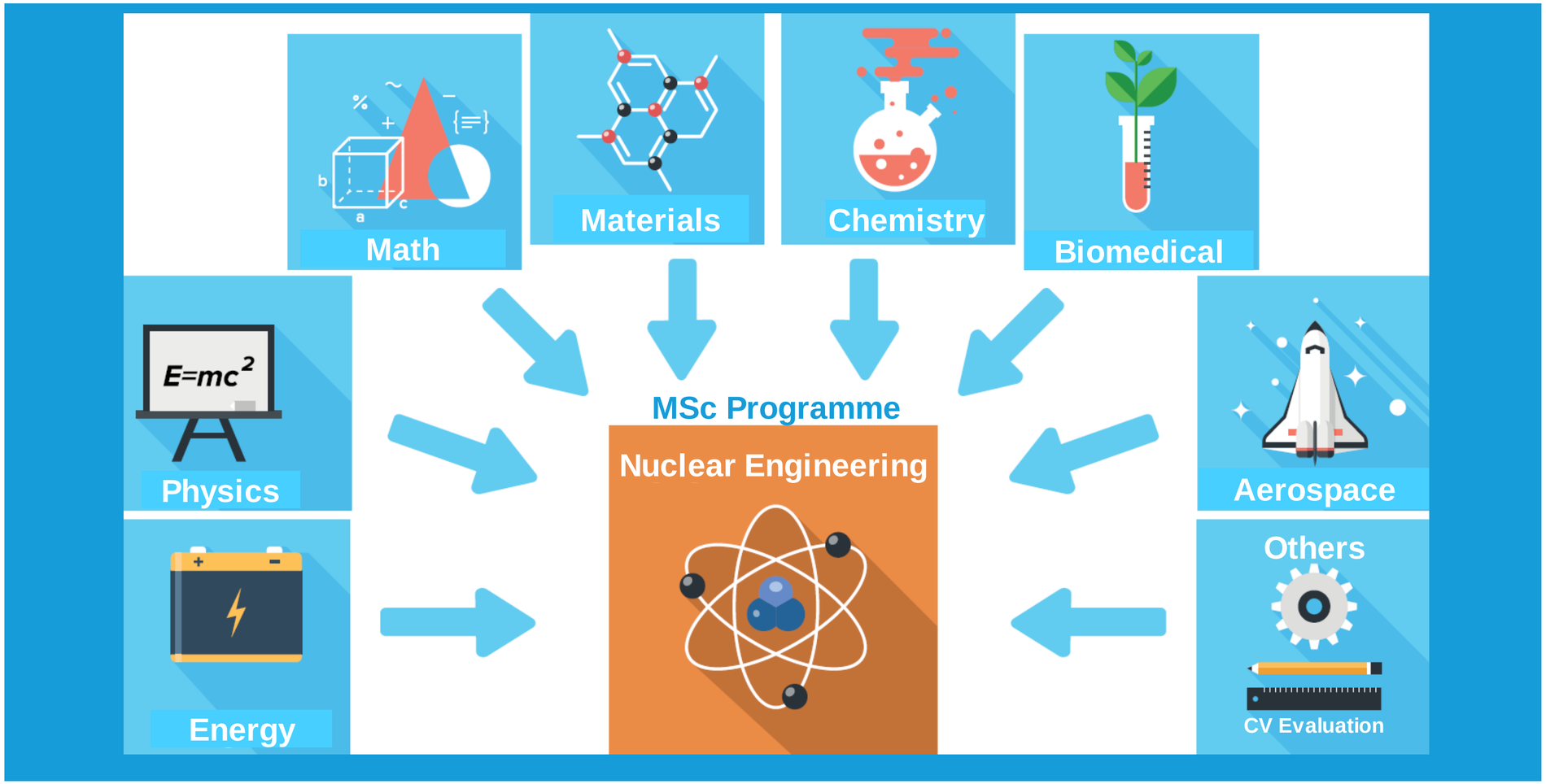
THESIS WORK (in Italy or abroad)

EXTRA

- **20 extra-credits for supplementary study programmes (Honours Programme)**
- **Double degree @POLIMI (e.g. MATH Eng + NUC Eng)**

How to get here?

POLITECNICO
MILANO 1863

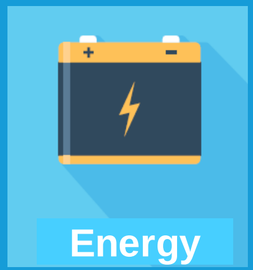


MANY ADMISSION POSSIBILITIES!

Preparatory tracks @POLIMI

POLITECNICO MILANO 1863

ENERGY ENG



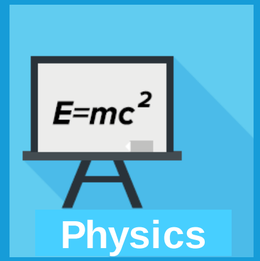
3rd year BSc

- Introduction to Nuclear Engineering (10 ECTS)
- Radioattività e/o Radioprotezione (5+5 ECTS)

1st year MSc NUC (20 ECTS)

- **Fisica Atomica (10)**
- **Multi-phase Systems and Technologies (5)**
- **Radioprotezione applicata/ Fisica del Nucleo (5)**

ENG PHYSICS



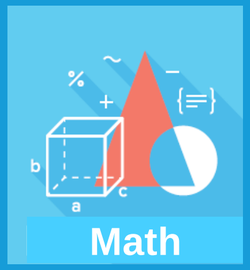
3rd year BSc

- Fisica del Nucleo e Laboratorio (10 ECTS)
- Meccanica dei solidi (5 ECTS)

1st year MSc NUC (20 ECTS)

- **Introduction to Nuclear Engineering (10)**
- **Multi-phase Systems and Technologies (5)**
- **Math/Num Methods for Eng (5)**

MATHEMATICAL ENG



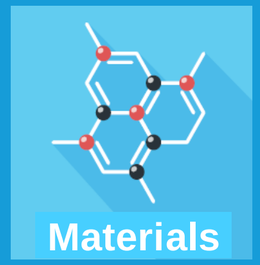
3rd year BSc

- Fisica Atomica (10 ECTS)
- Fisica del Nucleo (5 ECTS)

1st year MSc NUC (20 ECTS)

- **Introduction to Nuclear Engineering (10)**
- **Multi-phase Systems and Technologies (5)**
- **Lab Fisica del Nucleo/ Radioprotezione (5)**

MATERIALS ENG AND NANOTECH



3rd year BSc

- Fisica Atomica(10 ECTS)
- Fisica del Nucleo (5 ECTS)

1st year MSc NUC (20 ECTS)

- **Introduction to Nuclear Engineering (5)**
- **Multi-phase Systems and Technologies (5)**
- **Lab Fisica del Nucleo/ Radioprotezione (5)**
- **Metodi Matematici per l'Ingegneria (5)**

MANY ADMISSION POSSIBILITIES!

Preparatory tracks @POLIMI

POLITECNICO MILANO 1863

CHEMICAL ENG

3rd year BSc
- Fisica Atomica (10 ECTS)
- Fisica del Nucleo (5 ECTS)

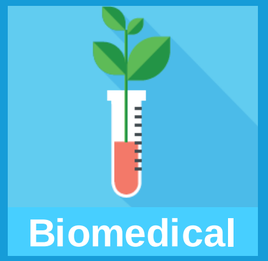
1st year MSc NUC (20 ECTS)
- **Introduction to Nuclear Engineering (10)**
- **Lab Fisica del Nucleo/ Radioprotezione (5)**
- **Multi-phase Systems and Technologies (5)**

AEROSPACE ENG

3rd year BSc
- Introduction to Nuclear Engineering (5 ECTS)
- Radioattività/ Radioprotezione (5 ECTS)

1st year MSc NUC (20 ECTS)
- **Fisica Atomica (10)**
- **Multi-phase Systems and Technologies (5)**
- **Radioprotezione applicata/ Fisica del Nucleo (5)**

BIOMEDICAL ENG



3rd year BSc
- Introduction to Quantum Physics (5 ECTS)
- Fisica del Nucleo (5 ECTS)

1st year MSc NUC (20 ECTS)
- **Introduction to Nuclear Engineering (10)**
- **Lab Fisica del Nucleo/ Radioprotezione (5)**
- **Advance Math/ Heat and Mass Transfer (5)**

OTHERS @POLIMI and external

3rd year BSc
Possibility @POLIMI of autonomous study curriculum including NUC ECTS

1st year MSc NUC
20 ECTS assigned by the MSc Access Commission under the advice of the Curricula Commission and according to the previous BSc student's curriculum

MANY ADMISSION POSSIBILITIES!

1st year

POLITECNICO MILANO 1863

20 ECTS — to complete the entry preparation

PREPARATORY COURSES: MATH, PHYSICS, NUCLEAR ENG, INDUSTRIAL ENG assigned by the MSc Access Commission under the advice of the Curricula Commission and according to the previous BSc student's curriculum

20 ECTS — MANDATORY Fundamentals of Nuclear Engineering

- RADIATION DETECTION AND MEASUREMENT (10 ECTS, 1 SEM)
- FISSION REACTOR PHYSICS 1 (10 ECTS, 2 SEM)

20 ECTS — ELECTIVE Fundamentals of Nuclear Engineering

- RELIABILITY, SAFETY AND RISK ANALYSIS (10 ECTS, 2 SEM)
- SOLID STATE PHYSICS/ FISICA DELLO STATO SOLIDO (10 ECTS, 2 SEM)
- INDUSTRIAL AND NUCLEAR ELECTRONICS A+B (10 ECTS, 1 SEM)

- RADIOCHIMICA APPLICATA (10 ECTS, 2 SEM)
- PHYSICS OF NUCLEAR MATERIALS+NUCLEAR TECHNIQUES FOR THE ANALYSIS OF MATERIALS (10 ECTS, ANNUAL COURSE)
- ARTIFICIAL INTELLIGENCE AND ADVANCED SIMULATION FOR THE SAFETY, RELIABILITY AND MAINTENANCE OF ENERGY SYSTEM (10 ECTS, 1 SEM)

STRONG FUNDAMENTALS + WIDE FLEXIBILITY

2nd year: Nuclear Plants

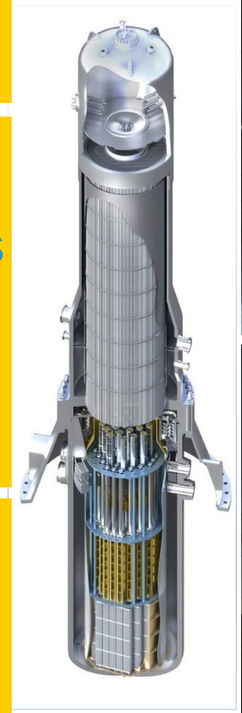
POLITECNICO MILANO 1863

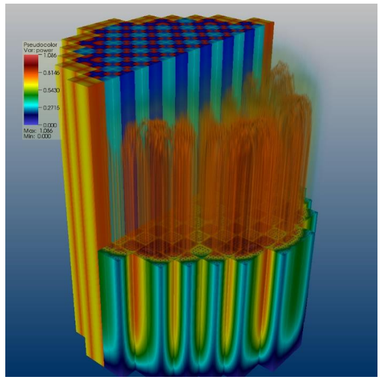
10 ECTS MANDATORY — NUCLEAR DESIGN AND TECHNOLOGY

10 ECTS ELECTIVE
- FISSION REACTOR PHYSICS II
- TRANSPORT OF RADIOACTIVE CONTAMINANTS
- EXPERIMENTAL NUCLEAR REACTOR KINETICS

10 ECTS ELECTIVE
- RADIOPROTEZIONE APPLICATA + CONTAMINAZIONE INTERNA
- ARTIFICIAL INTELLIGENCE FOR ENERGY SYSTEMS
- RELIABILITY, SAFETY AND RISK ANALYSIS A+B
- RADIOCHIMICA APPLICATA A+B
- MULTIPHASE SYSTEMS AND TECHNOLOGIES + CFD FOR NUCLEAR ENGINEERING

15 ECTS ELECTIVE
- INDUSTRIAL ENGINEERING
- DETECTION AND MEASUREMENT
- COMPUTATIONAL METHODS
- PHYSICS
- MULTIDISCIPLINARY/SOFT SKILLS





15 ECTS
- EXPERIMENTAL/THEORETICAL/MODELING THESIS WORK @POLIMI, RESEARCH CENTERS, COMPANIES

2nd year: Nuclear Technologies

POLITECNICO MILANO 1863

10 ECTS MANDATORY

NUCLEAR DESIGN AND TECHNOLOGY

10 ECTS ELECTIVE

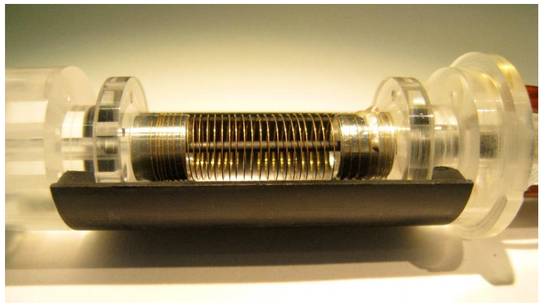
- MEDICAL APPLICATIONS OF RADIATION FIELDS
- CONTAMINAZIONE INTERNA + RADIOPROTEZIONE APPLICATA

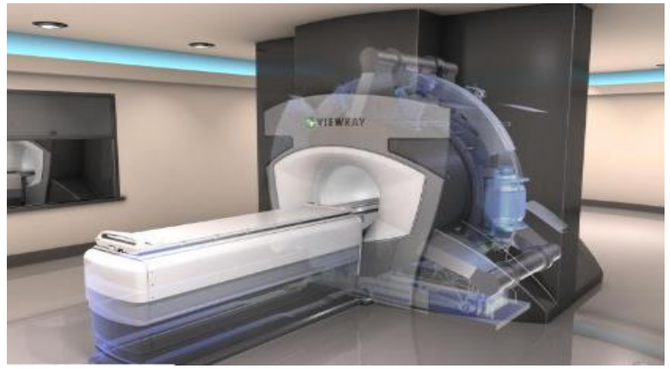
10 ECTS ELECTIVE

- RADIOCHIMICA APPLICATA A+B
- PHYSICS OF NUCLEAR MATERIALS + HIGH INTENSITY LASERS FOR NUCLEAR AND PHYSICAL APPLICATIONS (I or II)
- FISSION REACTOR PHYSICS II + TRANSPORT OF RADIOACTIVE CONTAMINANTS

15 ECTS ELECTIVE

- INDUSTRIAL ENGINEERING
- DETECTION AND MEASUREMENT
- COMPUTATIONAL METHODS
- PHYSICS
- MULTIDISCIPLINARY/SOFT SKILLS





15 ECTS

- EXPERIMENTAL/THEORETICAL/MODELING THESIS WORK @POLIMI, RESEARCH CENTERS, COMPANIES

2nd year: Nuclear Systems Physics

POLITECNICO MILANO 1863

10 ECTS MANDATORY

NUCLEAR DESIGN AND TECHNOLOGY

10 ECTS ELECTIVE

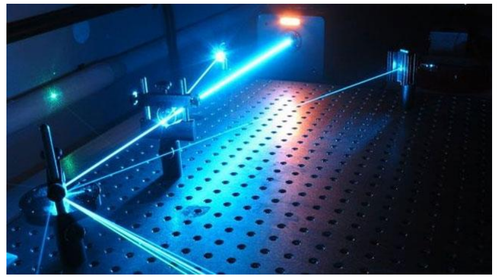
- MEDICAL APPLICATIONS OF RADIATION FIELDS
- HIGH INTENSITY LASERS FOR NUCLEAR AND PHYSICAL APPLICATIONS I+II

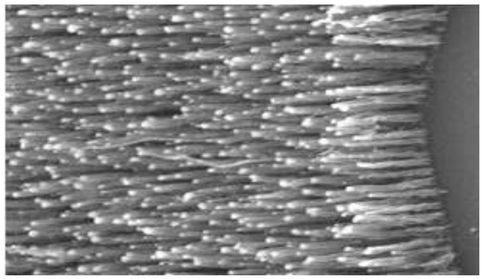
10 ECTS ELECTIVE

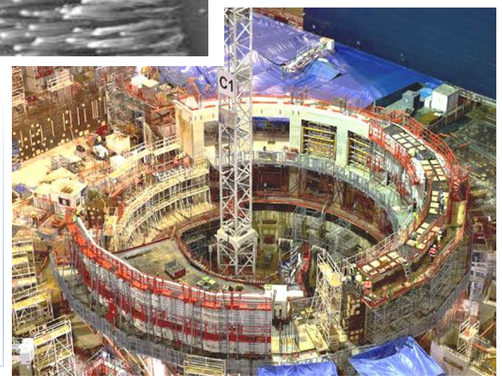
- PLASMA PHYSICS I+II
- PHYSICS OF NUCLEAR MATERIALS + PHYSICS OF DISORDERED MATERIALS
- FISSION REACTOR PHYSICS II + TRANSPORT OF RADIOACTIVE CONTAMINANTS
- STATISTICAL PHYSICS

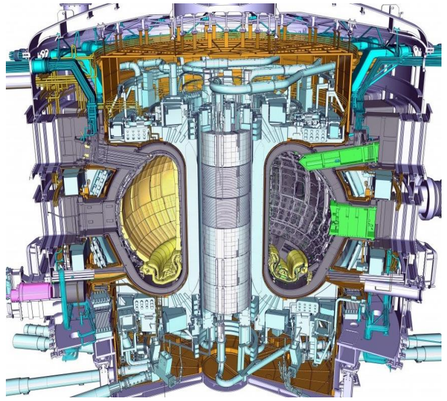
15 ECTS ELECTIVE

- INDUSTRIAL ENGINEERING
- DETECTION AND MEASUREMENT
- COMPUTATIONAL METHODS
- PHYSICS
- MULTIDISCIPLINARY/SOFT SKILLS







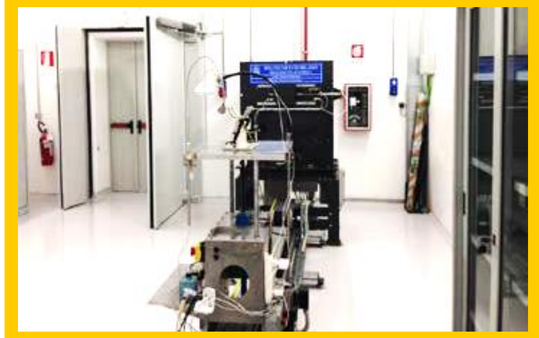


15 ECTS

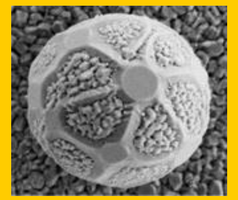
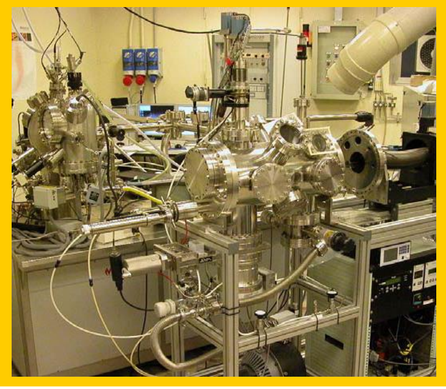
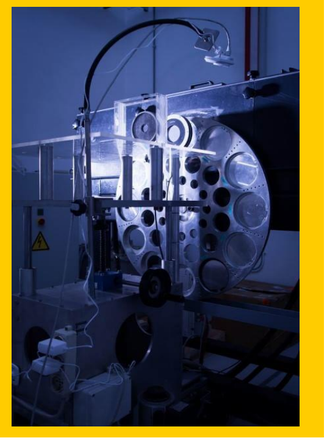
- EXPERIMENTAL/THEORETICAL/MODELING THESIS WORK @POLIMI, RESEARCH CENTERS, COMPANIES

Experimental laboratories

POLITECNICO MILANO 1863





Internal labs

- RADIOCHEMISTRY
- RADIOPROTECTION
- NUCLEAR MEASUREMENTS
- NUCLEAR ELECTRONICS
- RADIATION METROLOGY
- HEALTH PHYSICS
- MATERIALS AND NANOTECH.



External labs

- SIET LABORATORIES (Piacenza)
- «TRIGA» RESEARCH REACTOR (Pavia)
- ONCOLOGICAL HADRONTHERAPY CENTER (Pavia)

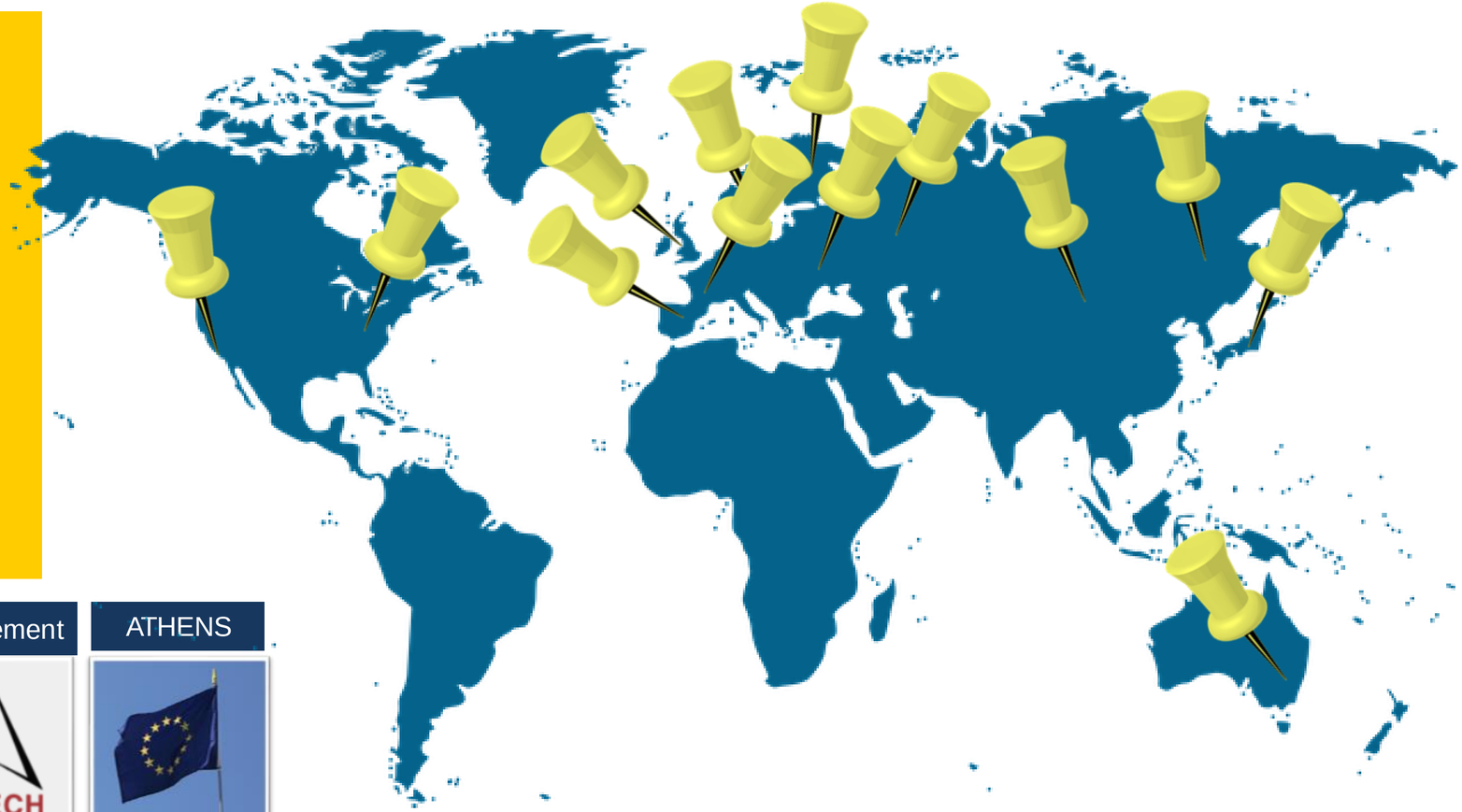
MANY HOURS DEDICATED TO EXPERIMENTAL ACTIVITIES

well above the average value of the other Engineering programmes!

Experiences abroad

POLITECNICO MILANO 1863

- BECAUSE NUCLEAR IS AN INTERNATIONAL CONTEXT
- BECAUSE THE COURSE IS OPEN TO NEW EXPERIENCES
- BECAUSE MANY NUCLEAR STUDENTS HAVE HIGH MARKS
- BECAUSE OF THE POSITIVE EXPERIENCES REPORTED BY STUDENTS



ERASMUS

GIAPPONE

TIME

Extra EU

Management

ATHENS

EUROPEAN AWARDS OF MSc DEGREE IN NUCLEAR ENGINEERING

enen European nuclear education network

FuseNet The European Fusion Education Network

After M.Sc. graduation

POLITECNICO MILANO 1863

INDUSTRY, R&D, CONSULTING, PUBLIC AUTHORITIES

≃53% OF GRADUATES

PhD

≃47% OF GRADUATES

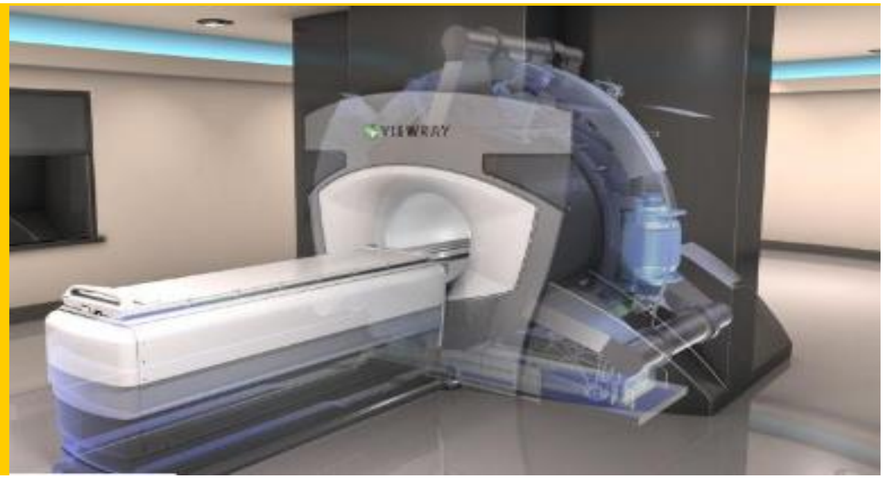
EDUCATION FOR WORK AND RESEARCH

Job opportunities

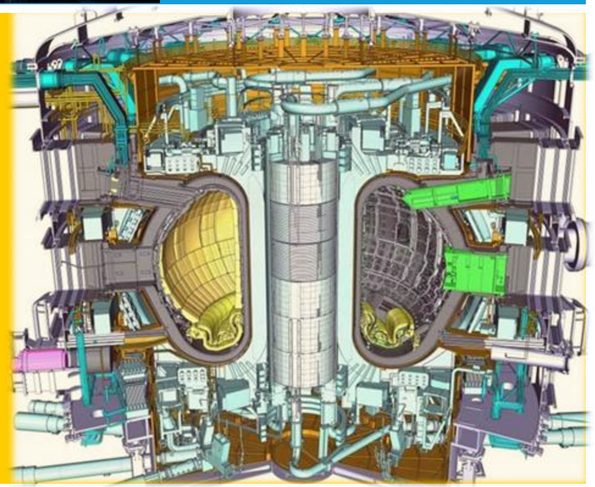
POLITECNICO MILANO 1863

NUCLEAR ENERGY & SAFETY INDUSTRY

MEDICAL NUCLEAR SYSTEMS



INDUSTRY AND CENTERS FOR NUCLEAR FUSION & HIGH ENERGY PHYSICS



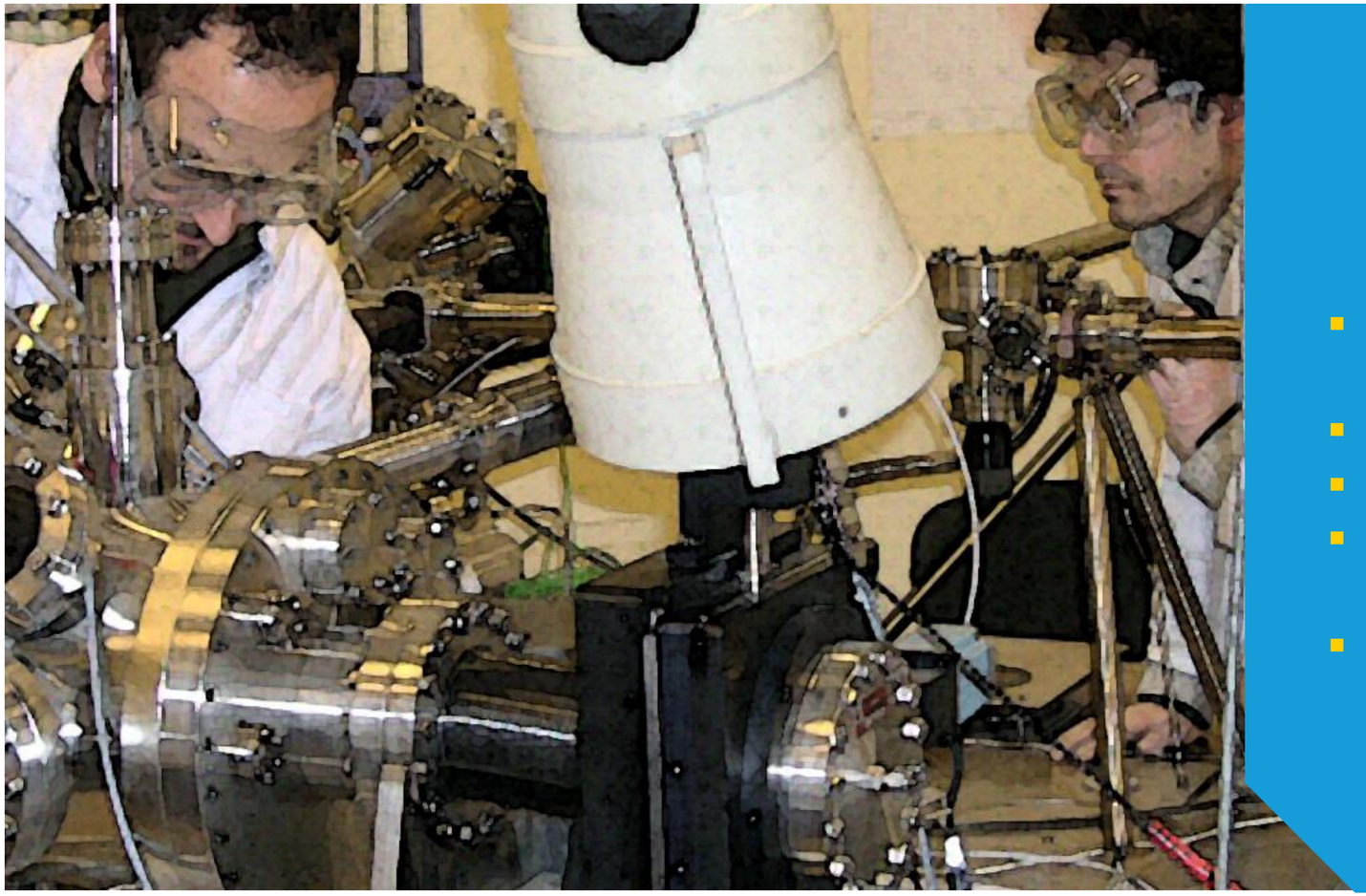
ENVIRONMENTAL AND INDUSTRIAL APPLICATIONS OF RADIATION

OTHER SECTORS IN ITALY AND ABROAD

- Consulting
- Engineering
- High Tech
- Supervisory Public Authorities
- Risk Assessment and Management

Doctoral studies

POLITECNICO
MILANO 1863



Ph.D.

- DEEP STUDY OF THEORETICAL, MODELING AND EXPERIMENTAL ASPECTS FOR RESEARCH
- DURATION: 3 YEARS
- SELECTION FOR ACCESS
- SCOLARSHIPS

- PROFESSIONAL OPPORTUNITIES: PUBLIC AND PRIVATE RESEARCH

PHD @POLIMI
ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY «STEN»

MSc ACCESS COMMISSION



Antonio Cammi

Piero Baraldi

Matteo Passoni

CURRICULA COMMISSION



Lelio Luzzi

Andrea Pola

Matteo Passoni

INTERNATIONAL MOBILITY


Francesco Di Maio

STUDENTS' DELEGATES

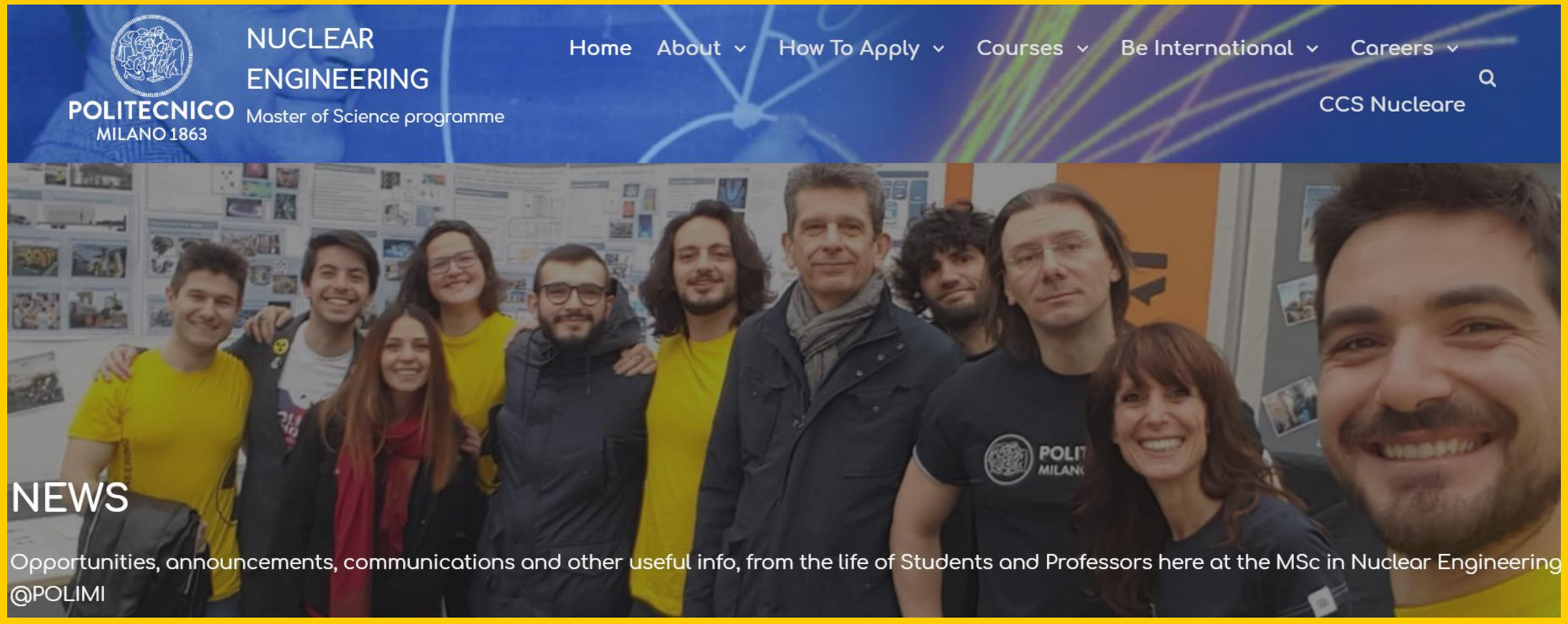


Andrea Baglivo

Ilaria Moschetti

Pierfrancesco Ombrini

rappresentantistudenti-ccsnucleare@polimi.it



http://www.ingnucleare.polimi.it/

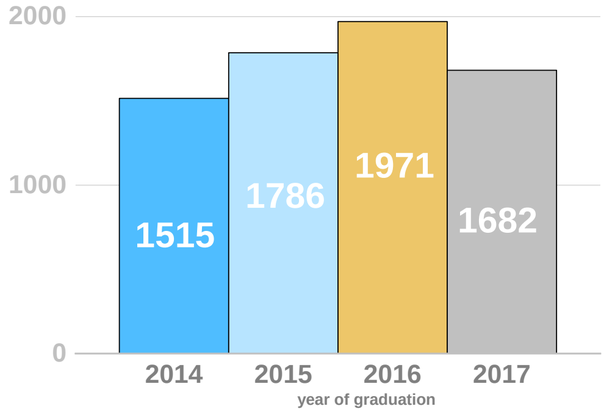
POLITECNICO
MILANO 1863

Employment rate

POLITECNICO MILANO 1863

RECENT GRADUATES YEARS 2014-2017

AVERAGE MONTHLY SALARY IN EURO PER YEAR (1° EMPLOYMENT)



AVERAGE MONTHLY SALARY (1° EMPLOYMENT)

1735 €

EMPLOYMENT RATE*

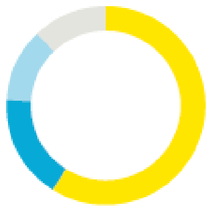
* 1 year after graduation, except students

WITHIN 6 MONTHS*

* % calculated on those employed 1 year after graduation

EMPLOYEES

CONTRACT TYPE*



Permanent	59%
Fixed-term	17%
Apprenticeship	12%
Internship	-
Other*	12%

* project based, occasional collaboration

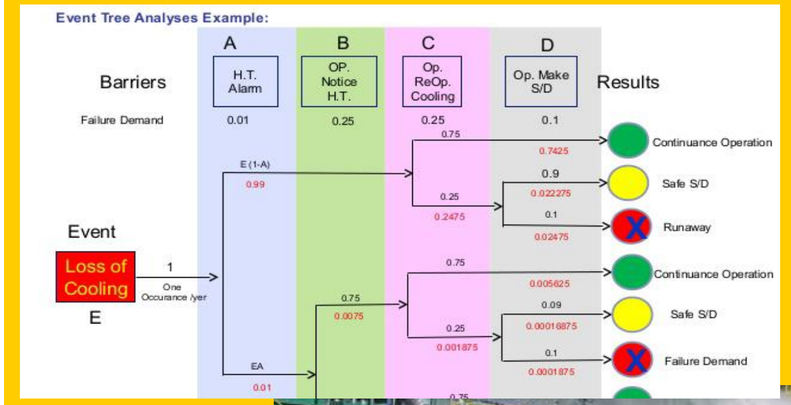
https://cm.careerservice.polimi.it/dati-occupazionali/#ing--ingegneria-nucleare

Job: nuclear sectors- 1

POLITECNICO MILANO 1863

NUCLEAR ENERGY INDUSTRY

NUCLEAR AND INDUSTRIAL SAFETY



MANY OPPORTUNITIES IN ITALY AND ABROAD

Job: nuclear sectors - 2

POLITECNICO MILANO 1863

INDUSTRIAL AND ENVIRONMENTAL APPLICATIONS OF RADIATIONS

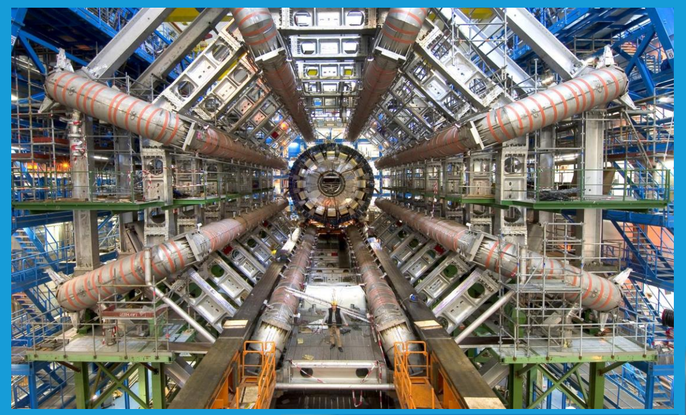
ENGINEERING OF MEDICAL NUCLEAR SYSTEMS

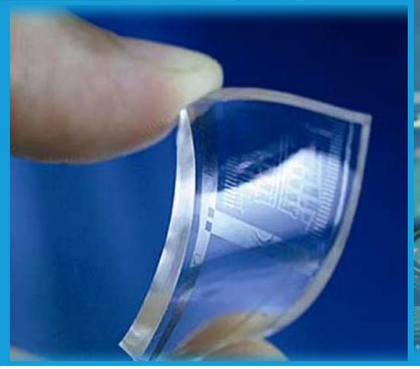
MANY OPPORTUNITIES IN ITALY AND ABROAD

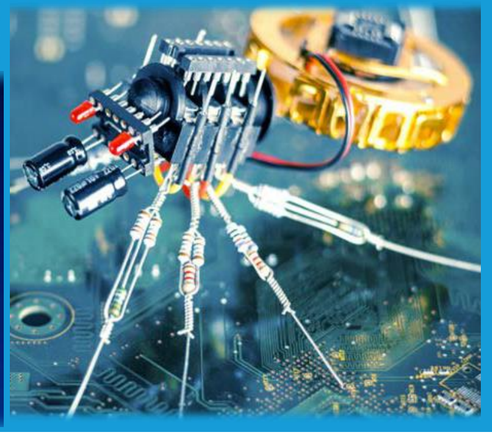
Job: nuclear sectors- 3

POLITECNICO MILANO 1863

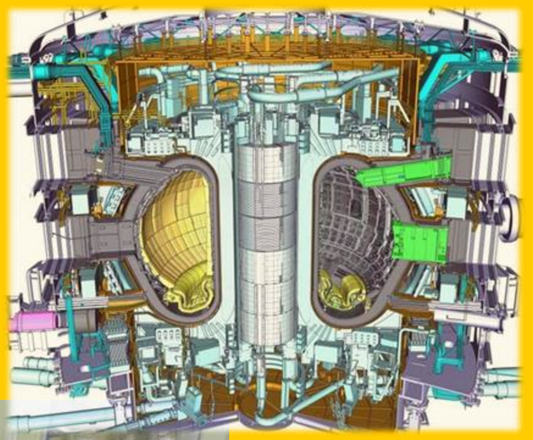
PHYSICS, ADVANCE MATERIALS, NANOTECHNOLOGY

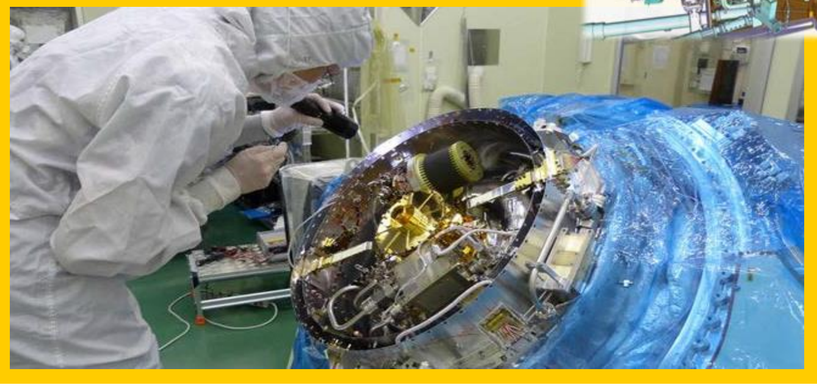






INDUSTRY AND DIAGNOSTICS FOR NUCLEAR FUSION





MANY OPPORTUNITIES IN ITALY AND ABROAD

Job: other sectors

POLITECNICO MILANO 1863

INDUSTRY, R&D, CONSULTING, PUBLIC AUTHORITIES

- CONVENTIONAL ENERGY SECTOR
- BIOMEDICAL SECTOR
- RISK ASSESSMENT AND MANAGEMENT
- PHYSICS AND MATERIALS
- HIGH TECHNOLOGY
- NATIONAL AND INTERNATIONAL SUPERVISORY PUBLIC AUTHORITIES (EUROPEAN COMMUNITY, IAEA, ..)
- …

MANY OPPORTUNITIES IN ITALY AND ABROAD