



POLITÉCNICA

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INDUSTRIALES   
ETSII | UPM

# INGENIA: PWR DESIGN AND SIMULATION

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“Impact of recent nuclear data evaluations on energy and non-energy nuclear applications”

23/05/2023



1. What is INGENIA?
2. Lectures and Invited Guests
3. Main activities in 'INGENIA-NUCLEAR'
4. Communication in 'INGENIA-NUCLEAR'





# 1. What is INGENIA?

- One of the main courses of the “Master in Industrial Engineering Program at UPM”
  - 12 ECTS : 5hours/week – 2 semesters
- Based on the **CDIO** (Conceive Design Implement Operate) initiative, which has been also adopted by other Universities: Delft, Politecnico di Milano, MIT, Stanford...
- INGENIA works on both **technical and transversal skills**.

Divided in three main working Modules



Sustainability  
Module

Communication  
Module

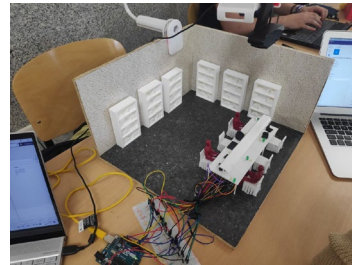
Technical  
Module

See more information about CDIO at: [www.cdio.org](http://www.cdio.org)

- INGENIA projects at UPM (in total 14):



Design of a walker for people with disabilities



Laser detection technology



Design of Daily-life products



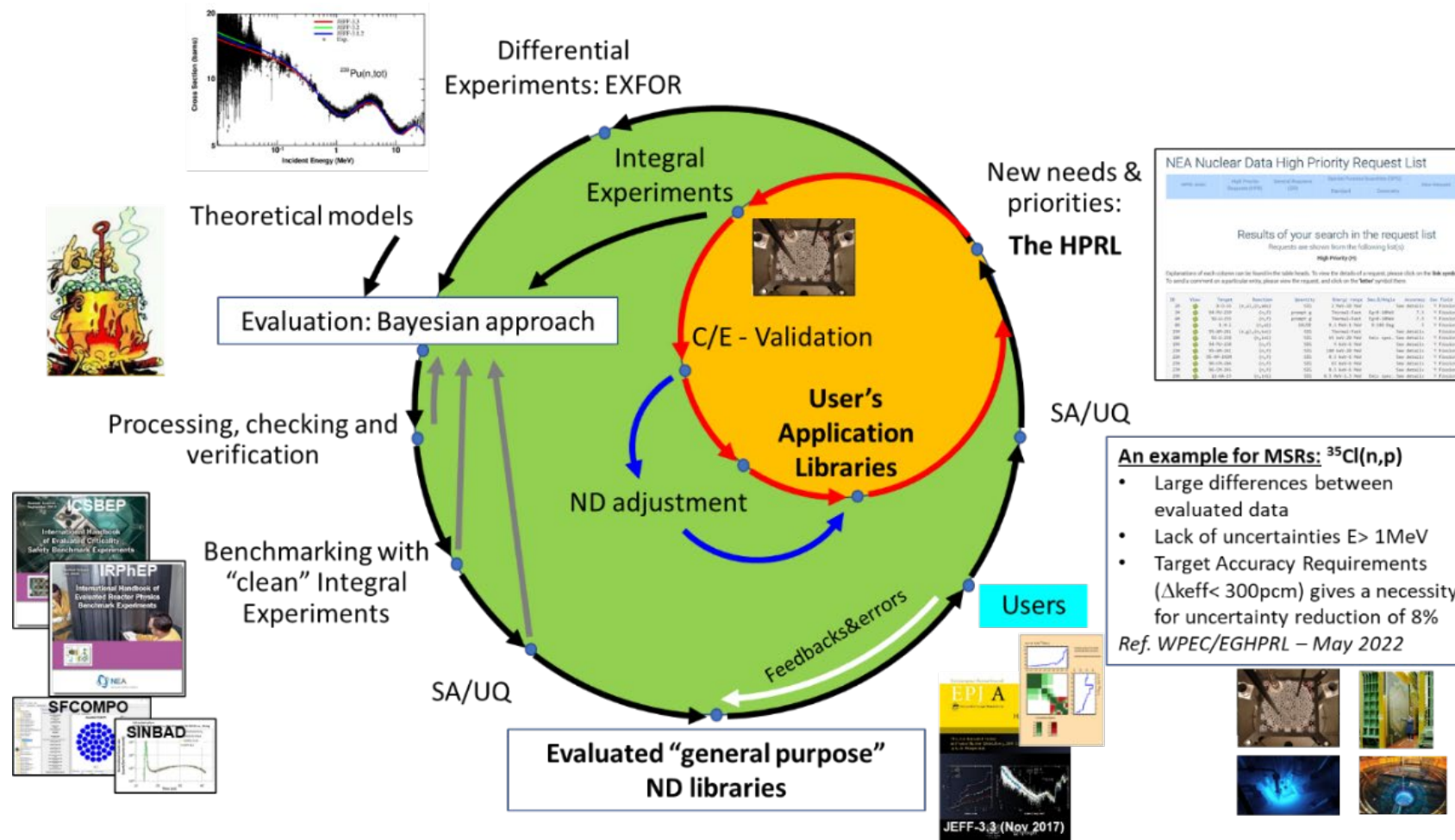
Automotive Engineers

- Other INGENIA projects:

Systems Engineering (to the construction of an intelligent technical system), Acoustic Engineering, Computer-aided Engineering (applied in material design), Thermal-Engine Design, Electric-System Design, Laser and Optics Design, ... Bioengineering,... , Beer Factory Project,...

# 2. Lectures Nuclear INGENIA

- Activities associated with nuclear data: **“the nuclear data life cycle”**



- The team (19 students): A **diverse group** with students with various specializations:
  - Energy technologies, Organization, Electrical, Electronics and Automation,...

Some of us with no previous knowledge in nuclear principles

## Theoretical formation

- Lectures on:**
- Introduction to Simulation and Simulators
  - Basic principles of nuclear physics
  - Nuclear Data (ENDF, JEFF)
  - Processing and Verification of nuclear data
  - Benchmarking, Validation
  - PWR design and operation: Safety, ...
  - Simulation of PWRs: Optimization & Manoeuvres
  - SEANAP system
  - ...

- Codes & databases:**
- EXFOR
  - Nuclear Data (ND): JEFF-3.3, JEFF 4T2.2
  - JANIS: visualization of ND
  - DICE: ICSBEP Handbook
  - NDAST: Sensitivity/Uncertainty
  - NJOY: processing ND
  - PREPRO2021
  - WLUP: WIMSD5 libraries (JEFF-3.3 and ENDF/B-VIII.0)
  - WIMSD5
  - SEANAP: Simulation of PWRs
  - ...

## 2. Lectures. Courses related

- ❑ **EU/H2020- GRE@T-PIONEER Project** (<https://great-pioneer.eu/>)
  - Gives specialised education and training resources for post-graduate students in reactor physics and safety.
- ❑ **E&T on Nuclear Data within the Great-Pioneer Project**
  - Experimental Data/Theory and Evaluation
  - Processing/Verification
  - Benchmarking/Validation
  - Sensitivity Analysis and Uncertainty Quantification
- ❑ **2nd Course on Nuclear Data :**
  - **September 4-8, 2023. Valencia (Spain) !**
- ❑ **To follow-up GRE@T-PIONEER activities at:**



[www.great-pioneer.eu](http://www.great-pioneer.eu)



[@GREATPIONEER\\_EU](https://twitter.com/GREATPIONEER_EU)



[@GREAT-PIONEER](https://www.linkedin.com/company/great-pioneer)



# 2. Guest Lectures

- **Naohiko Otsuka** ( February, 2023): Introduction to IAEA Nuclear Data Service and introduction to EXFOR Library-Mother of all libraries.
- **José Herrero** ( March, 2023): Presentation on different activities carried out by ENUSA, a leading company in the nuclear and energy sector in Spain.
- **Isabel Parrado** ( April, 2023): TECNATOM company representative explained how the simulators used by nuclear power plant operators are designed and work.
- **Arjan Plompen** (February,2023): Head of the Nuclear Data Section explained analysis of nuclear data.

### Other Guests:

- *Carolina Ahnert*
- *David Piedra*
- ...

### Guests from previous years:

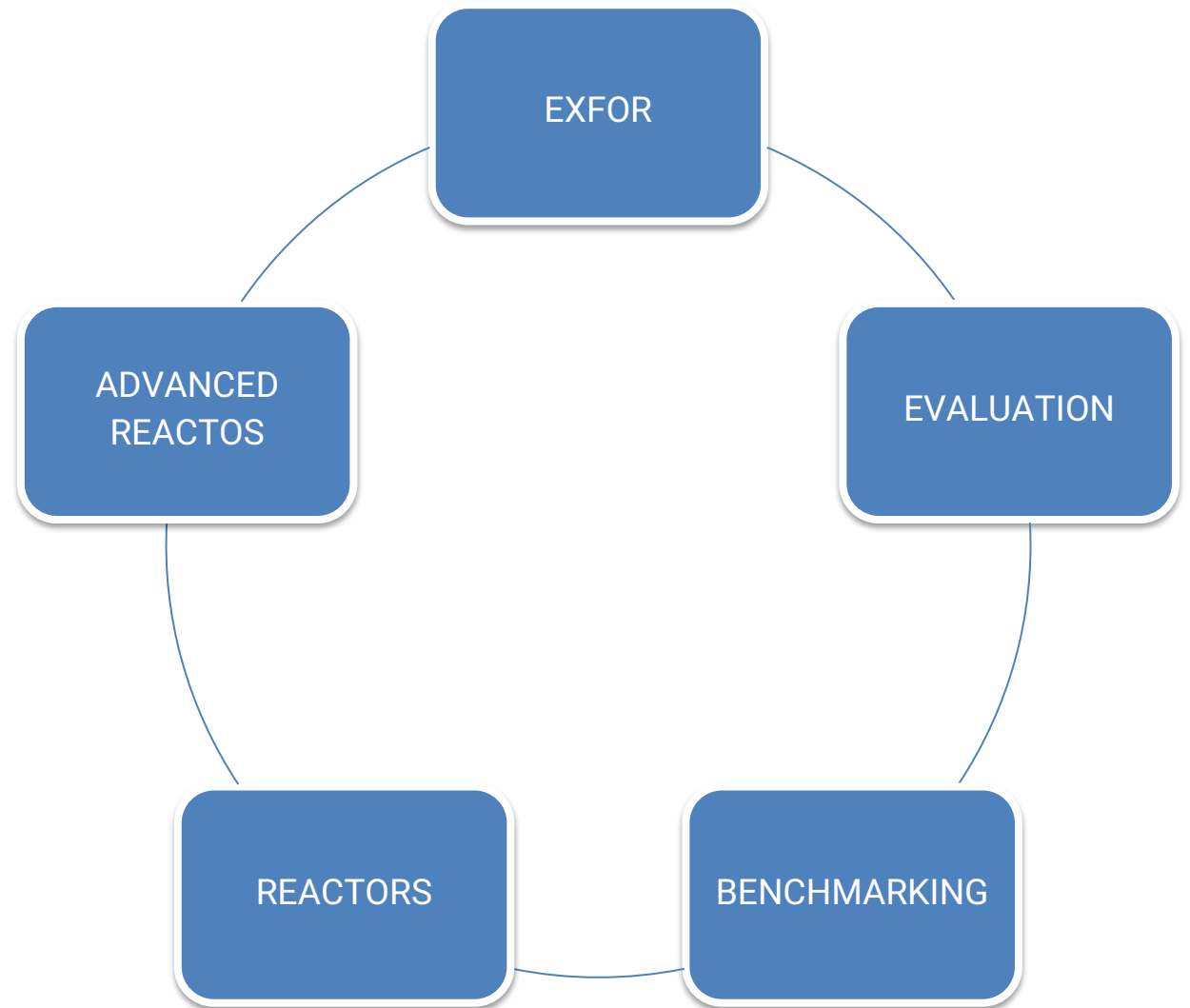
- *Luiz Leal*
- *Dennis Neudeker*
- ...





# 3. Main Activities in our 'INGENIA-NUCLEAR'

- Divided in five groups:



# 3. Participation in the Nuclear Data Week

- Participation in the **Nuclear Data Week - April 2023**
  - Three students went to Paris to present the groups work during the year



- M. Astigarraga et al., “Benchmarking and Validation with JEFF-4T2.2”, JEFF Meeting, April 25-28, 2023 JEF/DOC-2239
- M. González-Torre et al., “Feedbacks on Processing and Verification for JEFF-4T2.2”, JEFF Meeting, April 25-28, JEF/DOC-2224

The work carried out during the Ingenia was very well received and was mentioned during the summary of the day.

# 4. Communication in 'INGENIA-NUCLEAR'

- Another aspect on which the ingenia group has focused has been the diffusion of the activities carried out via instagram.



ingenianuclear Siguiendo Enviar mensaje +8 ...

28 publicaciones 360 seguidores 262 seguidos

### Ingenia Nuclear

Ciencia, tecnología e ingeniería

Equipo de Ingenia de 1ºMII de la ETSII-UPM dedicado al estudio, simulación y divulgación dentro del ámbito nuclear.

[drive.google.com/file/d/1rKkC\\_OFj-1u0\\_zm0bO8gep2awmfvVljm/view?usp=sharing](https://drive.google.com/file/d/1rKkC_OFj-1u0_zm0bO8gep2awmfvVljm/view?usp=sharing)

itaca\_upm, takepyr99, aereset y 6 más siguen esta cuenta



BenchMarking



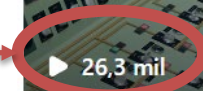
Evacuación



Experimentales



Reached more than 26 000 views!





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Thanks for your attention