

Nuclear Education in Brazil

Helen Khoury DEN/UFPE

19th November 2020





The Brazilian experience in nuclear energy

Brazil began developing nuclear technology in 1951 under the newly-established National Research Council-CNPq

Initially the activities are related to radioisotope applications for biomedical purpose.

In 1956 the **Institute of Atomic Energy (IEA),** current IPEN- **Nuclear and Energy Research Institute,** was created, and in 1959 initiated the production of radiopharmaceutical products.



The presence of large amounts of uranium minerals in the State of Minas Gerais contributed for the creation in 1952 at the Federal University of Minas Gerais of the CDTN- Center of Nuclear Technology and Development

1956: Creation of the Brazilian Nuclear Energy Commission (CNEN)

1958: Start of operation of the first nuclear research reactor (IEA-R1) in Latin America

Dosimetria e Instrumentação

Agriculture was established at the School of Agriculture of the University of São Paulo, in Piracicaba (SP). This center uses radioactive tracers in the study of fertilizer absorption and plant metabolism.

In 1968, motivated by the nuclear applications in agriculture and with the cooperation of the group of Piracicaba a Center for Nuclear Applications was created at the Federal University of Pernambuco (UFPE) in the Brazilian Northeast region. Later was transformed into the Nuclear Energy Department of UFPE





 In 1970, the government decided to initiate the construction of a nuclear plant

 This fact contributed to the increase in specialization courses, the training of professionals outside the country and the formation of graduate courses.



Research. development, applications and education: CNEN and its institutes (IPEN, CDTN, IEN, IRD, CRCN),

Public universities : (UFPE, Coppe/UFRJ, USP, UFMG) (UERJ, UFF, UNICAMP, UNIFESP)



• The development of the nuclear sector is closely related to the education and training of a sufficient number of qualified specialists



Authorization and evaluation of the Gradute courses

- CAPES Coordination for the Improvement of Higher Education Personnel is responsible for the evaluation of graduate programs as well as promoting international scientific cooperation.
- CAPES administers the Brazilian Scientific Mobility Program scholarship in cooperation with the National Council for Scientific and Technological Development (CNPq)



CAPES also evaluate the graduate courses considering infrastructure, scientific production, number and quality of the students gradated, etc. Course Concepts are in the range of 3 to 7

Courses with concepts 5 to 7 are considered of high quality and the excellence is for courses with concept 7

 In general the students receive scholarships to do the MSc and DSc degrees from the institutions: Capes, CNPq, CNEN and state science and technology foundations such as FAPESP, FACEPE, FAPEMIG and FAPERJ



Graduate Courses

- The graduate programs allocated by CAPES (Ministry of Education) in the Nuclear Engineering Area (Engenharia II) are here considered.
- There are Physics and hybrid graduate programs (MSc and DSc degrees) using nuclear and nuclearrelated techniques that contribute to the training of human resources in the nuclear area



Year	Institution	graduated students	
2020	 Universidade Federal do Rio de Janeiro (Escola Politécnica) 	53	



Graduated Students: 52

Current number of students : 99





Military Engineering Institute

- Initiated in 1958 as Specialization Course in Nuclear Engineering
- 1969 changed to Master course in Nuclear Engineering

Research Areas

Concept at CAPES: 3

Nuclear Reactors Environmental control

IEN/CNEN IEN/CNEN NUCLEAR ENGINEERING INSTITUTE

Graduate Program in Science and Nuclear Technology-Only Master degree Beginning : 2010 Concept at Capes: 3

Research Areas:

- Technology and Safety in Reactors
- Environmental Impact of Nuclear Installations
- Nuclear Applications in Industry, Health, Safety and Environment



Research Areas:

Science and Technology of Materials Science and Technology of Minerals and environment Science and Technology of Radiations





Dosimetria e Instrumentação DEN - UFPE

> PROTEN is the only stricto sensu graduate program in the nuclear area that operates in the Brazilian North and Northeast regions and one of the pioneers in the areas of renewable energy.

 Total numbers of M.Sc. Dissertations and D.Sc Theses until December 2019 MSc: 417 DSc: 199



NUCLEAR ENGINEERING UFRJ







Total numbers of M.Sc. Dissertations and D.Sc Theses (1969 – 2020)

MSc - 634DSc - 340

Total numbers of current enrolled graduate students

MSc - 30DSc - 117







Where do the MSc and DSc students work after graduation?

- Faculties at public and private universities
- Government labs (IEN, IRD, IPEN, CDTN, etc)
- Eletronuclear
- Uranium Mining and Fuel Company (INB)
- Oil Industry (e.g., Petrobras)
- Medical Installations (Radiotherapy, Nuclear medicine, Radiology)
- High schools and technical schools
- Others



Short Courses

• For Industries and Medical Areas: Examples

- Radiation protection
- Nuclear Legislation
- Nuclear instrumentation
- Radiation Dosimetry



Museum of Nuclear Sciences

www.museunuclear.com

- It is a non-formal teaching space
 - It is an educational-cultural space for the dissemination and socialization of the knowledge of the applications of Nuclear Energy in medicine, industry, agriculture and electricity generation.





Thank you

Helen khoury Helen.khoury@ufpe.br

