

Nuclear Education at UFRJ

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Education and Training Panel, 19 November 2020

WNU Short Course on "The World Nuclear

Industry Today"



Key Events

- 1792 Royal Academy of Artillery, Fortification and Design (origin of IME, AMAN, and POLI/UFRJ)
- 1874 Polytechnic School POLI
- 1920 University of Rio de Janeiro University of Brazil Federal University of Rio de Janeiro - UFRJ
- 1963 **COPPE** Graduate School of Engineering
- 1968 M.Sc. Program in Nuclear Engineering, **COPPE**
- 1979 D.Sc. Program in Nuclear Engineering, **COPPE**
- 2010 Undergraduate Program in Nuclear Engineering, POLI/UFRJ

Key Numbers

	Degrees awarded	Enrolled Students	Scholarship
M.Sc.	617	30	15
D.Sc.	333	117	45
Undergraduates	53	150	

Faculty and Staff

- 17 Full-time faculty members
 - (40% growth in last 3 years)
 - 9 Full Professors, all CNPq Research Fellows
 - 3 Assciate Professors
 - 5 Assistant Professors
- 6 Adjunct Faculty members
- Technical and Administrative Staff in Department Office and Laboratories

Research Areas

- Reactor Physics
- Reactor Engineering
- Applied Nuclear Physics
- Safety Anaysis

- (4 faculty members)
- (3 faculty members)
- (5 faculty members)
- (3 faculty members)
- Human Factor Engineering (2 faculty members)

Laboratories

- Laboratory of Nuclear Instrumentation LIN
- Laboratory of Monitoring and Processing LMP
- Laboratory of Simulation and Methods in Engineering – LASME
- Laboratory of Environmental Analyses and Computational Simulation – LAASC
- Laboratory of Numerical Methods LMN
- Laboratory of Computing for Undergraduates (LIG)

M.Sc. Program Structure

- Two years 8 trimestrial terms (Three years maximum)
- Term 1 4 required courses: Nuclear Physics, Reactor Physics, Reactor Engineering, NPP Monitoring and Safety
- Term 2 1 required course: Radioprotection
 3 elective courses
- Term 3 M.Sc. Seminar M.Sc. Candidate
- Terms 4 to 8: Research
- Term 8: Dissertation Defense

(each course has 45 teaching hours)

D.Sc. Program Structure

- Four years 16 trimestrial terms (Five years maximum)
- Year 1 4 elective courses
- Year 2 Qualification Exam D.Sc. Candidate
- Year 3 Research
- Year 4 Research

Publication of at least one article in an SCIindexed international journal

• Year 4 – Thesis Defense

(each course has 45 teaching hours)

Undergraduate Program – 5 years – 10 terms

Group	Credits	Minimum Hours
Required Courses	178	2895
Complementary Courses: Restricted Choices	4	465
Complementary Courses: Conditioned Choices	32	480
Supplementary Activities	6	340
Complementary Courses: Free Choices	4	60
Total	224	4240

FUNDAMENTAL PHASE – 4 Terms



PROFISSIONAL PHASE – 6 Terms



Term 1

Term 2

MAC118 – Calculus I

FIT112 – Physics I-A

- FIS111 Experimental Physics I
- MAB114 Computing I

IQG111 – Chemistry

EEW210 – Introduction to Engineering

MAC128 – Calculus II FIT122 – Physics II FIS121 Experimental Physics II MAE125 – Linear Algebra II EEG105 – Projective Systems EEH210 – Engineering and Environment MAB225 – Computing II

Term 3

Term 4

MAC238 – Calculus III FIM230 – Physics III FIN231 –Experimental Physics III EEA212 – Mechanics I MAD201 – Probability and Statistics EEI312 – Economics A

MAC248 - Calculus I IV

EEU240 – Introduction to Modern Physics

FIN241 – Experimental Physics IV

EEE385 – Electricity I

MAB231 – Numerical Calculus

EEI321 – Industrial Organization

Term 5

EEK303 – Classical Thermodynamics

EEH214 – Transport Phenomena

EEU018 – Mathematical Methods of Nuclear Engineering I

EEU301 – Applied Nuclear Physics

EET310 – Principles of Material Science

Term 6

EEU503 – Reactor Physics I

EEK331 – Solid Mechanics I

EEU019 – Computational Numerical Methods

EEU516 – Basic Radiation Protection

EEK401 – Heat Transfer I

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Term 9

EEK525 – Alternative Sources of Energy

Term 10

EEU028 – Nuclear Fuel Cycle EEU521 – Risk Analysis of Nuclear Facilities

Elective Nuclear Courses

EEU029 Inverse Problems in Reactor Engineering I EEU030 Inverse Problems in Reactor Engineering II EEU031 Solution Techniques for Neutron Diffusion Equation EEU032 Introduction to Computational Tomography EEU033 Basic Dosimetry EEU034 Introduction to C++ Programming EEU035 Introduction to C++ Program with MFC EEU036 Energy Economics EEU525 Complementary Techniques of NDE EEU561 Applied Probabilistic Models EEU562 Reliability Tests EEU563 Uncertainty Analysis EEU564 Introduction to PDE Solution

Elective Nuclear Courses

EEU565 Analysis of Nuclear Reactor Accidents EEU566 Dynamic Control of Nuclear Reactors EEU571 Computational Methods Applied in Nuclear Engineering EEU572 Evolutive Optimization Applied in Nuclear Engineering EEU573 Artificial Neural Networks Applied in Nuclear Engineering EEU574 Fuzzy Systems Applied in Nuclear Engineering EEU575 Monitoring of Nuclear Power Plants EEU576 Accident Identification Nuclear Power Plants EEU580 Introduction to Fundamental Solution Methods EEU581 Laboratory of Reactor Physics EEU590 Energy Generation EEU601 Computational Fluid Dynamics I

Number of Nuclear Engineers Graduated





Certificate Programs

- Specialization Program (>= 360h)
- Qualification and Training Program (< 360h)
- Offered for INB, ABDAN, Navy
- Funded by companies or organizations
- Module of Nuclear Propulsion for Specialization Program of Navy officers

Final Remarks

- UFRJ provides high quality Nuclear Education
- Well structured curriculum for B.Sc., M.Sc. & D.Sc.
- Certificate programs have been offered
- Aims to seek Excellence in Graduate Education
- Aims to increase Number of Nuclear Engineers graduated
- Aims to seek cooperations with industrial partners
- Aims to seek cooperations with international partners