ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA | AREA
FORMAZIONE E DOTTORATO

PROFESSIONAL MASTER'S PROGRAMME DATA SHEET

Title	Nuclear Energy Fundamentals and Applications
Code	6226
Level	2nd level
Director	Emanuele Ghedini
Disciplinary area	Science and Technology
Professional Master's Programme description: **outcomes/targets**	Pursuant to Decree no. 270 of 22 October 2004 of the Ministry of Education, University and Research, for academic year 2025/2026, Alma Mater Studiorum – Università di Bologna, Administrative office of Bologna, will run a II-level Professional Master's Programme in "Nuclear Energy Fundamentals and Applications". The Professional Master's Programme has been set up on the proposal of the Department of Industrial Engineering (DIN) and in cooperation with ENEA. The Professional Master's Programme aims to provide candidates with previous technical-scientific skills in the non-nuclear field with the knowledge necessary to operate in the field of nuclear energy applications, with particular reference to fission technologies. Faced with the renewed interest in nuclear energy that is found at a global level in response to energy needs related to the reduction in the use of fossil fuels, a strong criticality arises linked to the lack of personnel who have, in addition to technical-scientific skills (e.g., mechanical, electrical, materials), also a knowledge of the context and specific requirements deriving from the application of these in the field of nuclear energy. The Master aims to provide graduate technicians with an adequate understanding of the context in which they operate within the nuclear supply chain, providing basic skills in the field of reactor physics, nuclear plants up to the fourth generation, nuclear safety, materials, radiation engineering and radiation protection, reactor thermo-hydraulics and the economics of energy plants. Students will apply the knowledge acquired to conduct and interpret experimental campaigns of real interest at laboratories of world excellence in nuclear research.
Qualifications required for admission	- Second Cycle Degree (or equivalent foreign or old-system qualification) in the following disciplinary fields/degree classes: Physics (LM/17), Chemical Sciences (LM/54), Industrial Chemical Sciences and Technologies (LM/71), Aerospace Engineering (LM/20), Biomedical Engineering (LM/21), Chemical Engineering (LM/22), Safety Engineering (LM/26), Electrical Engineering (LM/28), Electronic Engineering (LM/29), Energy and Nuclear

	Engineering (LM/30), Engineering Management (LM/31), Mechanical Engineering (LM/33), Environmental Engineering (LM/35). - Candidates in possession of an equivalent foreign or old-system qualification, provided that they have a *curriculum vitae et studiorum* that documents qualified competence in the technical subjects that are a prerequisite for the master's degree. Based on a positive evaluation by the Selection Committee, candidates with other master's degrees in a scientific field may also be admitted to the selection process, provided they present a curriculum vitae et studiorum that documents qualified preliminary expertise in the subjects covered by the Master's program.
Other admission requirements (registration with a professional register, specialisation school, other qualifications, English proficiency, work experience, etc.)	Knowledge of the English language to be verified during the admission test.
Course structure diagram	**Teachings Classes:** *I Cycle* 1. **Nuclear Physics Fundamentals** – SSD: IIND-07/C – Lecturers: Matteo Gherardi, Marco Sumini (2 CFU) 2. **Radiation Protection and Measurement Fundamentals** – SSD: IIND-07/C – Lecturers: Domiziano Mostacci, Francesco Teodori (2 CFU) 3. **Nuclear Reactor Physics** – SSD: IIND-07/C – Lecturers: Emanuele Ghedini, Davide Giusti (4 CFU) 4. **Nuclear Power Plants I** – SSD: IIND-07/D – Lecturers: Antonio Cervone, Sandro Manservisi, Giacomo Grasso (4 CFU) *II Cycle* 5. **Nuclear Safety and Risk Analysis** – SSD: IIND-07/D – Lecturers: Federico Rocchi, Paolo Vestrucci (3 CFU) 6. **Structural Metals & Alloys for Nuclear Applications** – SSD: IIND-03/C – Lecturers: Carla Martini (2 CFU) 7. **Irradiation Damage and Corrosion in Metallic Materials for Nuclear Applications** – SSD: IIND-03/C – Lecturers: Carla Martini, Marco Utili (2 CFU)

	8. **Mechanical Design for Nuclear Energy Applications** – SSD: IIND-03/A – Lecturers: Giangiacomo Minak (2 CFU) 9. **Nuclear Power Plants II** – SSD: IIND-07/D – Lecturers: Giacomo Grasso, Sandro Manservisi, Antonio Cervone (3 CFU) *III Cycle* 10. **Nuclear Technologies** – SSD: IIND-07/D – Lecturers: Marco Utili (2 CFU) 11. **Core and Plant Thermal Hydraulics**– SSD: IIND-07/A – Lecturers: Francesco Lolli, Gian Luca Morini, Massimiliano Polidori (3 CFU) 12. **Nuclear Instrumentation and Control Systems** – SSD: IIND-07/D – Lecturers: Giacomo Grasso, Marco Utili (2 CFU) *IV Cycle* 13. **Fuel Cycle, Waste Management and Decommissioning** – SSD: IIND-07/C – Lecturers: Francesco Troiani (3 CFU) 14. **Economics of Nuclear Power Plants** – SSD: IIND-07/D – Lecturers: Davide Tabarelli (2 CFU) 15. **Nuclear Fusion Energy Fundamentals** – SSD: IIND-07/C – Lecturers: Emanuele Ghedini, Matteo Gherardi (2 CFU) **Laboratory Activities:** • **Nuclear Reactor Physics Laboratory (ENEA Casaccia, Rome)** – SSD: IIND-07/C – Lecturers: Giacomo Grasso (3 CFU) • **Nuclear Technologies Laboratory (ENEA Brasimone, Bologna)** – SSD: IIND-07/C – Lecturers: Marco Utili (3 CFU) **Seminars:** • **Nuclear Energy Evolution** – SSD: IIND-07/C – Lecturers: Romolo Laurita (1 CFU) • **Introduction to Modelling Techniques in Nuclear Energy** – SSD: IIND-07/C – Lecturers: Marco Sumini, Antonio Cervone (1 CFU)
Closing date for applications (to register for selection)	29/09/2025

Selection method	Selection based on qualifications and interview. Minimum score: 60/100 In the event of a tie, preference will be given to the youngest candidate.
Selection date	06/10/2025
Ranking list publication date	13/10/2025 The ranking lists may be viewed on Studenti Online using your username and password.
Enrolment period	13/10/2025 - 30/10/2025
Available places	Min 8 – Max 25
Fees	Selection procedure participation fee: € 60,00 (non-refundable fee for administrative services, Art. 1 of the Call for Applications) The Master's fee has been set at € 3.250. However, voluntary contributions from stakeholders in the nuclear energy sector allowed the reduction of the fee to € 1.800. Total fee € 1.800 (one thousand eight hundred euro) (to be paid by the enrolment end date)
Places reserved for professional staff and foreign language instructors of the University of Bologna (part-time Professional Master's Programmes only)	On part-time Professional Master's Programmes only, two places in excess of the maximum number are reserved for professional staff and foreign language instructors of the University of Bologna. Such students will be exempted from paying tuition fees, net of any fixed costs. Preferably before registering for selection, please complete the form available on the intranet page Measures for participation of professional staff and foreign language instructors in postgraduate programmes recognised by the University of Bologna. APOS will inform the applicants directly of the outcome of their request. For further information, please contact apos.master-ta@unibo.it
Reserved seats for the Almae Matris Alumni Association	There will be 1 excess places, with reduced fees (20% less than the registration fee) for Alumni (i.e. former students of the Alma Mater Studiorum) registered with the Almae Matris Alumni Association
Administrative office	Bologna
Place of teaching	Bologna

	Two laboratories (3+3 CFU) will be held in Brasimone (Bologna) and Casaccia (Rome). Travel and accommodation already included in the registration fee.
Language	English
Duration	One year part time
University educational credits (CFUs)	60
Mandatory attendance	80%
Teaching mode	Blended: both in person and remote. Teachings will be accessible both in person and remote. Laboratories and seminars only in person.
Internship or project work and final examination	350 hours (14 CFU) are reserved for internship. Internship plan for each student will be defined with the master's scientific committee during the first six months. Companies and institutions supporting the master and available for internship are: - ENEA - newcleo - Ansaldo Nucleare - SIET - EDISON - SRS Servizi di Ricerche e Sviluppo S.r.l.
Class start date and teaching calendar information	Teaching will start on the week of 17-21/11/2025. Classes will be grouped in two days per week (Mon-Tue or Thu-Fri depending on calendar and teacher's agenda). A total of 12 hours per week is foreseen, distributed in the two days (6+6 or 4+8). Teaching will be structured in cycles: **I Cycle**, 12 CFU, 96 hours, 8 weeks (Nov 2025- Jan 2026): Nuclear Physics Fundamentals Radiation Protection and Measurement Fundamentals Nuclear Reactor Physics Nuclear Power Plants I **II Cycle**, 12 CFU, 96 hours, 8 weeks (Feb 2026- Apr 2026): Nuclear Safety and Risk Analysis Structural Materials & Alloys for Nuclear Applications Irradiation Damage and Corrosion in Materials for Nuclear Applications Mechanical Design for Nuclear Energy Applications

	Nuclear Power Plants II **III Cycle**, 7 CFU, 56 hours, 5 weeks (May 2026- Jun 2026): Nuclear Technologies Core and Plant Thermal Hydraulics Nuclear Instrumentation and Control Systems **IV Cycle**, 7 CFU, 56 hours, 5 weeks (Jun 2026- Jul 2026): Fuel Cycle, Waste Management and Decommissioning Economics of Nuclear Power Plants Nuclear Fusion Energy Fundamentals Each cycle will be followed first by a week without classes and then by an examination week, where students will be examined by cycles lecturers. **Laboratories** are preliminary scheduled in May 2026 and Jul 2026. **Full time internships** are foreseen from Sep 2026 to Nov 2026 (350 hours). However, due to the reduced classes time in II and IV cycles, some internships may begin previously depending on each student's specific internship plan. https://www.unibo.it/it/studiare/dottorati-master-specializzazioni-e-altra-formazione/master/2025-2026/nuclear-energy-fundamentals-and-applications
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