ENVIRONMENTAL ENGINEERING PROGRAM – PEA/UFRJ

ACADEMIC DOCTORATE

Curriculum Structure

1-Profile of Egress Graduated Professionals

Professionals graduating from the PhD course in the Environmental Engineering Program will have a solid scientific and cultural background, qualifying them to face global environmental challenges and act in dialogue with international players, defining strategies and technologies and seeking innovative solutions. As such, this professional will work to create sustainable strategies in order to balance the ecologically correct with the economically viable in the long term.

Subject area of concentration: Environmental Engineering

Total course load: 540 class hours

Credits for degree in subjects: 36 credits
The course is structured in four annual quarters. Students complete their teaching load during these quarters, and then enroll in Thesis Research (0 credits).

Degree to be awarded: Doctor of Science in Environmental Engineering

2- Description of Research Lines

- **Built Environment**

Sustainable Buildings: Our researchers are dedicated to creating buildings that not only house people, but also respect the planet. We study environmentally friendly building materials, architectural designs that optimize the use of resources, and intelligent water and energy management systems.
Energy Efficiency: Energy conservation is essential for a sustainable future. Our research focuses on developing technologies and strategies to reduce energy consumption in buildings, making them more efficient and economical.

Integrated Sustainability: Sustainability goes beyond simple energy efficiency. Our research incorporates a holistic approach that encompasses social, economic and environmental aspects. We are committed to creating solutions that benefit communities and the environment.

Interaction with the Natural Environment: The interaction between the natural and built environment addresses the complex relationship between cities and the natural environment that shelters them, focusing on the constituent elements of the city (buildings, infrastructure networks and open spaces) as well as the integration of these elements in the context of urban functioning in an integrated way and its performance in terms of quality of life and the environment. Our researchers investigate this interaction to offer diagnostic, planning and design tools, in a context of integrated, sustainable, resilient and low-risk urban-environmental development.

- **Industrial Ecology and Suistainability**

Eco-Innovation and Energy Efficiency: Our researchers are at the forefront of eco-innovation, seeking new ways to improve energy efficiency across all sectors. This ranges from innovative energy policies to the development of renewable energies and new technologies that have the potential to revolutionize the way we consume and produce energy. Green engineering, remanufacturing, industrial eco-hubs, life cycle engineering and industrial sustainability indicators are just some of the areas we are working on to create a greener and more sustainable future.

Reliability, Resilience and Risk Management: Understanding and managing the risks associated with socio-technical systems is of utmost importance. Our research includes quantitative assessment, consequence analysis and studies on risks in complex systems. In addition, we examine cognitive ergonomics and human reliability, ensuring that systems are designed with the safety and well-being of operators and the wider community in mind. We are also attentive to socio-environmental disasters associated with mass movements, working to prevent them and mitigate their impacts.

Environmental Governance and Regulation: In a rapidly changing world, environmental governance and regulation play a key role in promoting sustainable practices. Our research covers how policies and regulations can be developed and implemented effectively to protect our environment and the communities that depend on it.

- **Sanitary Engineering**

Urban Sanitary Engineering Systems: The design and development of water supply, urban drainage and sewage systems, seeking to create integrated and sustainable solutions that meet the growing needs of urban areas, ensuring that everyone has access to clean water and adequate sanitation.

Sewage Treatment and Reuse: Development of advanced technologies for the treatment of sewage. This includes physical-chemical and biological processes that not only ensure safe disposal, but also pave the way for the reuse of these valuable resources.

- **Environmental Management and Safety**

Risk Management: Predicting potential situations that may affect the desired objectives of an organization and the environment through the application of technical, financial and chronological analyses, thus optimizing the company's capital.

Resilience Engineering: Development of engineering methods based on the analysis of cognitive work, aiming at the modeling of complex situations, correctly identifying and valuing the behaviors and resources that contribute to the capacity of a system to respond to the unexpected.

- **Environmental Technologies**

Industrial Effluent Treatment: On a planet where water is an increasingly precious resource, our researchers are committed to developing innovative technologies for the treatment of industrial effluents. This involves physical, chemical and biological processes that not only ensure safe disposal, but also enable the reuse of these waters, contributing to the preservation of our water resources.

Atmospheric Emissions: In a world seeking to reduce its carbon footprint, our research focuses on several fronts. We are managing carbon emissions with detailed inventories, capture and storage, as

well as investigating mitigation and emission control technologies. Our work also includes environmental monitoring, allowing a diagnostic and prognostic assessment of air quality, to ensure a cleaner and healthier environment.

Solid Waste: A fundamental part of our research line focuses on solid waste management. This involves strategies for collection, recycling, reverse logistics and the assessment of the life cycle of recycled products and processes. Furthermore, we are committed to developing new applications for waste, creating solutions to minimize environmental impact and promote more sustainable practices.

3 - Curriculum Structure

The student must complete 36 credits to obtain the title of Master of Science in Environmental Engineering. Regardless of the credits chosen and used, the student must take **Research Methodology** (structured in seminars) and a subject of restricted choice, namely **Applied Mathematical Methods** or **Planning and Statistical Data Analysis**. Students coming from the PEA master's degree are exempt from taking Research Methodology and the subject of conditional choice (Applied Mathematical Methods or Data Planning and Statistical Analysis).

Students with a master's degree from other post-graduate programs may request exemption from taking the Research Methodology subject, provided they can prove they have already taken it during their master's degree. The request will be evaluated by the Teaching and Student Body Committee.

The credits obtained during the master's course will be used as part of the workload for the doctorate. Thus, the student must take 12 credits in subjects during the PEA doctoral course. The student may take up to 1/3 of the credits in subjects from other post-graduate programs, limited to a maximum of 4 credits. Once the credits have been completed, the student must pass a qualifying exam in order to continue the course.

The subjects available to make up the total credits required for the PhD course (each with 3 credits, 45h) are shown in Table 1, with the exception of Thesis Research.

Table 1: SUBJECTS AND THEIR ASSOCIATION TO RESEARCH LINES

Code	Subject title	Research Lines				
		Built Environment	**Industrial Ecology and Sustainability**	**Sanitary Engineering**	**Environmental Management and Safety**	**Environmental Technologies**
PEA- 727	Built Environment I - Buildings	X				
PEA- 728	Built Environment II - Energy Efficiency, Sustainability and Performance	X				
PEA- 729	Built Environment III - Natural/Built Environment Interaction	X				
PEA- 709	Life Cycle Assesment – Methodological Framework and Computational Tools		X		X	
PEA- 704	Life Cycle Assessment, Governance and Sustainability		X		X	
EEA- 708	Urban Solid Waste Landfills			X		
PEA- 706	Biomass and Bioenergy		X			
EEA- 701	Biomonitoring and Bioindicators		X			

Code	Subject title	Research Lines				
		Built Environment	**Industrial Ecology and Sustainability**	**Sanitary Engineering**	**Environmental Management and Safety**	**Environmental Technologies**
PEA- 803	Water Sensitive Cities	X			X	
EED- 725	Control of Atmospheric Emissions					X
PEA- 700	Disasters Associated with Mass Movements	X			X	
EED- 728	Development of Sustainable Materials and Technologies	X				X
EED- 773	Eco-Innovation in Oil, Gas and Biofuels		X			
EED- 719	Ecology Applied to Industry		X			
EED- 789	Industrial Ecology, Green Engineering and Sustainability		X			
	Ecotoxicology applied to Wastewater Treatment			X		X
EEA- 703	Life Cycle Engineering		X		X	
PEA- 808	Teaching Internship I	Mandatory for scholarship holders, but not counted towards the minimum total workload required by the Graduate Program for credit completion – 30 h, 2 credits				
PEA- 809	Teaching Internship II	Mandatory for scholarship holders, but not counted towards the minimum total workload required by the Graduate Program for credit completion – 30 h, 2 credits				
PEA- 724	Environmental Geotechnics	X			X	
PEA- 725	Geotechnics and Dam Safety	X			X	
EED- 704	Risk Management		X		X	
PEA- 730	Building Rehabilitation Management	X				

Code	Subject title	Research Lines				
		Built Environment	Industrial Ecology and Sustainability	Sanitary Engineering	Environmental Management and Safety	Environmental Technologies
PEA- 718	Hydraulics applied to Environmental Sanitation			X		
PEA- 711	Applied Hydrology		X	X	X	
EED- 700	Licensing and Environmental Studies		X		X	
EED- 702	Research Methodology	Mandatory Subject				
PEA- 702	Applied Mathematical Methods	Restricted Elective Subject				
EED- 718	Flood Wave Modeling	X				
EED- 708	Dissertation Research					
PEA- 801	Planning and Statistical Data Analysis	Restricted Elective Subject				
EED- 710	Strategic Environmental Management Planning				X	
PEA- 715	Municipal Public Policies			X	X	
EED- 788	Pollution and Water Quality			X		X
PEA- 719	Pollution Potential and Treatment of Landfill Leachate			X		X
EED- 731	Advanced Oxidative Processes applied to Water and Effluent Treatment			X		X
PEA- 714	Production, Purification and Energy Utilization of Biogas					X
PEA- 716	Industrial Property Applied to Environmental Engineering				X	

Code	Subject title	Research Lines				
		Built Environment	**Industrial Ecology and Sustainability**	**Sanitary Engineering**	**Environmental Management and Safety**	**Environmental Technologies**
EED- 736	Technological Forecasting				X	
PEA- 710	Recycling in Solid Waste Management			X		X
EED- 729	Recovery of Degraded Areas		X		X	
PEA- 712	Urban Resilience to Flooding	X				
EED- 784	Reuse of Water and Industrial Effluents			X		X
PEA- 703	Social and Environmental Risks, Strategy and Corporate Sustainability		X		X	
	Sustainability and Comfort in the Built Environment	X			X	
EEA- 709	Sustainability in Construction	X				
PEA- 708	Technologies for recycling post-consumer polymeric materials		X			X
	Decarbonization Technologies					X
EEA- 712	Special Topics in Environmental Engineering	Subject aligned with the research areas of PEA				
EED- 722	Industrial Effluent Treatment			X		X
	Useful Life and Pathologies of Buildings	X				

4- Permanent Professors by Research Line

Research Line	Professors
Built Environment	Assed Naked Haddad Bruno Barzellay Ferreira da Costa Carina Mariane Stolz Cláudia do Rosário Vaz Morgado Eduardo Linhares Qualharini Leandro Torres Di Gregório Marcos Barreto de Mendonça Marcelo G. Miguez Matheus Martins de Sousa Mayara Amario Mohammad Najjar Osvaldo Moura Rezende
Industrial Ecology and Sustainability	Ana Lúcia Nazareth da Silva Assed Naked Haddad Cláudia do Rosário Vaz Morgado Claudinei de Souza Guimarães Eduardo Linhares Qualharini Elen Beatriz Acordi Vasquez Pacheco Estevão Freire George Victor Brigagão José Luiz Medeiros Maria Fernanda S. Quintela da Costa Nunes Ofélia de Queiroz Fernandes Araújo Suzana Sérgio Luiz Costa Bonecker Suzana Borschiver
Sanitary Engineering	Fabiana Valéria da Fonseca Araujo Felipe Sombra dos Santos Juacyara Carbonelli Campos Lídia Yokoyama Marcelo G. Miguez Matheus Martins de Sousa Monica Pertel Osvaldo Moura Rezende
Environmental Management and Safety	Assed Naked Haddad Bruno Barzellay Ferreira da Costa Cláudia do Rosário Vaz Morgado Eduardo Linhares Qualharini Marcelo Gomes Miguez Marcos Barreto de Mendonça Mayara Amario
Environmental Technologies	Ana Lúcia Nazareth da Silva Elen Beatriz Acordi Vasquez Pacheco Fabiana Valéria da Fonseca Araujo Felipe Sombra dos Santos George Victor Brigagão José Luiz Medeiros Juacyara Carbonelli Campos Lídia Yokoyama Mayara Amario Ofélia de Queiroz Fernandes Araújo Suzana Borshiver

5- Lattes CV Address of Permanent Professors

Ana Lúcia Nazareth da Silva	http://lattes.cnpq.br/5162297431633790
Assed Naked Haddad	http://lattes.cnpq.br/9435253973268969
Bruno Barzellay Ferreira da Costa	http://lattes.cnpq.br/7117021915552772
Carina Mariane Stolz	http://lattes.cnpq.br/9664121892237031
Cláudia do Rosário Vaz Morgado	http://lattes.cnpq.br/6062201353355454
Claudinei de Souza Guimarães	http://lattes.cnpq.br/4751042363197664
Eduardo Linhares Qualharini	http://lattes.cnpq.br/2902782553995387
Elen Beatriz Acordi Vasques Pacheco	http://lattes.cnpq.br/9542083518570573
Fabiana Valéria da Fonseca	http://lattes.cnpq.br/8778107230566167
Felipe Sombra dos Santos	http://lattes.cnpq.br/5926740038366443
George Victor Brigagão	http://lattes.cnpq.br/2175970050042336
José Luiz de Medeiros	http://lattes.cnpq.br/5883317325439133
Juacyara Carbonelli Campos	http://lattes.cnpq.br/7972936754516344
Leandro Torres Di Gregório	http://lattes.cnpq.br/1234253492596748
Lídia Yokoyama	http://lattes.cnpq.br/2256328830667523
Marcelo Gomes Miguez	http://lattes.cnpq.br/3622226693741021
Marcos Barreto de Mendonça	http://lattes.cnpq.br/9219077334380862
Maria Fernanda S. Quintela da Costa Nunes	http://lattes.cnpq.br/5901025579908200
Matheus Martins de Sousa	http://lattes.cnpq.br/4814824925847471
Mayara Amario	http://lattes.cnpq.br/0198481360058254
Mohammad Najjar	http://lattes.cnpq.br/9772249202095015
Mônica Pertel	http://lattes.cnpq.br/2889587223725512
Ofélia de Queiroz Fernandes Araújo	http://lattes.cnpq.br/2347662604044532
Osvaldo Moura Rezende	http://lattes.cnpq.br/2037101650756694
Sérgio Luiz Costa Bonecker	http://lattes.cnpq.br/0075077134149701
Suzana Borschiver	http://lattes.cnpq.br/9279812350120595