

PhD in Environmental Engineering

Curriculum · 6 semesters · 120 ECTS credits · 3000 academic hours

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| 120 ECTS Credits | 6 Semesters | 24 Courses | 3000 Academic Hours |
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■ Required
 ■ Research
 ■ Elective
 ■ Thesis

Semester 1 — Foundations and Methodology 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|---|---|------|-------|----------|
| ENV-ENG-101 | Ecosystems and Environmental Services | Structure and functioning of ecosystems; valuation of environmental services and biodiversity. | 5 | 125h | Required |
| ENV-ENG-102 | Advanced Environmental Chemistry | Geochemical reactions, biogeochemical cycles, speciation of contaminants in environmental matrices. | 5 | 125h | Required |
| ENV-ENG-103 | Scientific Research Methodology | Experimental design, hypothesis formulation, literature review, data management and scientific writing. | 5 | 125h | Research |
| ENV-ENG-104 | Environmental Statistics and Geostatistics | Multivariate analysis, regression models, kriging and spatial analysis applied to environmental problems. | 5 | 125h | Required |

Semester 2 — Pollution and Treatment 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|---|--|------|-------|----------|
| ENV-ENG-201 | Advanced Wastewater Treatment | Advanced physico-chemical and biological processes: MBR, UASB, advanced oxidation and micropollutant removal. | 5 | 125h | Required |
| ENV-ENG-202 | Air Pollution and Control | Pollutant dispersion, air quality modeling, emission control technologies. | 5 | 125h | Required |
| ENV-ENG-203 | Solid and Hazardous Waste Management | Waste hierarchy, material and energy recovery, hazardous waste and WEEE treatment. | 5 | 125h | Required |
| ENV-ENG-204 | Soil and Groundwater Remediation | In situ and ex situ techniques; bioremediation, phytoremediation, multiphase extraction and reactive barriers. | 5 | 125h | Required |

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Semester 3 — Climate Change and Assessment 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|---|---|------|-------|----------|
| ENV-ENG-301 | Climate Change and Climate Modeling | General circulation models, IPCC scenarios, vulnerability and adaptation to climate change. | 5 | 125h | Required |
| ENV-ENG-302 | Environmental Impact Assessment and SEA | EIA and strategic environmental assessment methodologies; risk analysis and public participation. | 5 | 125h | Required |
| ENV-ENG-303 | Hydrology and Watershed Management | Hydrological cycle, rainfall-runoff modeling, integrated water resource management and IWRM. | 5 | 125h | Required |
| ENV-ENG-304 | Elective I — Constructed Wetland Engineering | Design and operation of constructed wetlands for wastewater treatment and stormwater control. | 5 | 125h | Elective |

Semester 4 — Emerging Technologies and Thesis Proposal 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|---|---|------|-------|----------|
| ENV-ENG-401 | Environmental Biotechnology | Bioprocesses, bioreactors, applications of microorganisms in treatment and advanced bioremediation. | 5 | 125h | Required |
| ENV-ENG-402 | Environmental Economics and Ecological Valuation | Externalities, environmental policy instruments, contingent valuation and cost-benefit analysis. | 5 | 125h | Required |
| ENV-ENG-403 | Elective II — GIS and Environmental Remote Sensing | Geographic information systems, raster/vector analysis, satellite imagery and vegetation indices. | 5 | 125h | Elective |
| ENV-ENG-404 | Doctoral Thesis Proposal | Preparation, presentation and defense of the doctoral proposal before the academic committee. | 5 | 125h | Thesis |

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Semester 5 — Research and Publication 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|--|---|------|-------|----------|
| ENV-ENG-501 | Advanced Research Seminar I | Progress presentations, peer review, methodological discussion and engagement with the scientific community. | 5 | 125h | Research |
| ENV-ENG-502 | Elective III — Environmental Nanotechnology | Nanomaterials for water treatment, nanoscale environmental sensors and ecotoxicity assessment. | 5 | 125h | Elective |
| ENV-ENG-503 | Research Internship or Exchange | Academic exchange at an external institution; minimum 4 weeks with technical report and external co-supervisor. | 5 | 125h | Research |
| ENV-ENG-504 | Scientific Writing and Publication | Strategies for writing ISI/Scopus articles, editorial process, peer review and research ethics. | 5 | 125h | Research |

Semester 6 — Doctoral Thesis and Defense 20 ECTS

| CODE | COURSE NAME | DESCRIPTION | ECTS | HOURS | TYPE |
|-------------|--|---|------|-------|----------|
| ENV-ENG-601 | Advanced Research Seminar II | Final presentation of results and validation with an external jury prior to the defense. | 3 | 75h | Research |
| ENV-ENG-602 | Research Ethics and Biosafety | Professional ethics, laboratory biosafety, data protection and intellectual property. | 2 | 50h | Required |
| ENV-ENG-603 | Doctoral Thesis — Development and Writing | Writing the final thesis document: introduction, methodology, results, discussion and conclusions. | 10 | 250h | Thesis |
| ENV-ENG-604 | Public Doctoral Thesis Defense | Presentation and defense before an external examining committee; evaluation of originality and scientific contribution. | 5 | 125h | Thesis |

PhD in Environmental Engineering · Official Curriculum · 120 ECTS Credits · 3 Academic Years