ANNEX A TO THE AGREEMENT OF COOPERATION FOR THE GRANTING OF DUAL DEGREES

1. Dual Degree programmes activated under the Agreement

Each Dual Degree programme is structured in four semesters made up of courses and research, two semesters to be completed at the University of Bologna, and two semesters to be completed at the University of Liège. The Agreement applies to Master/second cycle degree programmes listed in Table 1.

Dual Degree Programme	Academic Degree obtained at UNIBO	Academic Degree obtained at ULiege
CIVIL ENGINEERING	Laurea Magistrale in Civil Engineering (Classe LM 23)	Master : ingénieur civil des constructions
ENVIRONMENTAL ENGINEERING	Laurea Magistrale in Ingegneria per l'Ambiente ed il Territorio (Classe LM 35)	Master : ingénieur civil des mines et géologue

Table 1: Dual Degree Programmes activated under the agreement

Only the students enrolled in the above listed programmes will be offered the opportunity to participate in the pertinent Dual Degree programme. Upon completion of Dual Degree programme, the students will be awarded two separate and distinct degrees, one from each Partner university, as stated in Article 2. The specific academic degrees obtained by completing each Dual Degree programme are listed in Table 1.

The tables of equivalence for each dual degree programme together with the tables of elective courses/courses freely chosen at both parties are reported in Annex B.

ANNEX B - dual degree programme "civil engineering"

Curriculum "Structural Engineering" @UNIBO - Professional Focus "Civil Engineering" @ULiège

First year

UNIBO		ULiège	
Advanced Structural Mechanics (TAF B, SSD ICAR/08)	9	Structural analysis I	5
		Structural Analysis II	5
Geotechnical Engineering (TAF B, SSD ICAR/07)	6	Geotechnical Structures Conception and Execution	5
		Soils and Rocks mechanics	5
Numerical Methods (TAF C, SSD MAT/08)	12	Linear numerical methods in Civil and Geological Engineering	5
Advanced Design Of Structures (TAF B, SSD ICAR/09)	9	Concrete and new Materials Technologies	5
		Prestressed concrete structures and masonry	5
		Metallic and Steel-Concrete composite Structures	5
Advanced Hydrosystems Engineering (TAF B, SSD ICAR/02)	9	Fluvial hydrodynamics	5
Sustainable Transport System Design (TAF B, SSD ICAR/05)	9	Free surface flow	5
		Design and execution of hydraulic navigation structures	5
Design Project (TAF F)	6	Buildings conception and execution	5
	60		**60**

Second year

UNIBO		ULiège	
Managing engineering and construction processes (TAF C, SSD ING-IND/35)	6	Principles of management	5
Preparation for the Final Examination Abroad (TAF E)	12	Master Thesis	25
Final Examination (TAF E)	6		
4 Elective courses - TAF B from Table 1	24	Design and execution of dams and water networks	3
2 Courses freely chosen by the student - TAF D from Table 2	12	Road infrastructure conception and execution	3
		Bridges Conception and Execution	3
		Integrated project	7
		5 Courses freely chosen by the student from Table 3	15
	60		**61**

Table 1

Design of Foundations and Retaining Structures (ICAR/07)	6
Mechanics of Historical Masonry Structures (ICAR/08)	6
Structural Safety (ICAR/09)	6
Structural Strengthening & Rehabilitation (ICAR/09)	6
Computational Mechanics (ICAR/08)	6
Earthquake Engineering (ICAR/09)	6

Table 2

Applied Geomatics (ICAR/06)	6
DESIGN OF FOUNDATIONS AND RETAINING STRUCTURES (ICAR/07)	6
Design of Large-Scale Structures (ICAR/09)	6
Engineering Geology (GEO/05)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Mechanics of Historical Masonry Structures (ICAR/08)	6
Road Safety Engineering (ICAR/04)	6
Science and Technology of Composite Materials M (ING-IND/22)	6
Structural Safety (ICAR/09)	6
Structural Strengthening & Rehabilitation (ICAR/09)	6
Sustainable Building Design (ICAR/10)	6
Sustainable Road Infrastructures (ICAR/04)	6
Biotechnology for the Sustainable Reclamation of Contaminated Lands and Waters (ICAR/03)	6
Building Information Modeling (ICAR/17)	6
Computational Mechanics (ICAR/08)	6
Earthquake Engineering (ICAR/09)	6
Large-Scale Water Structures (ICAR/02)	6
Public Procurement (IUS/10)	6
Sustainability In Construction (ICAR/09)	6
Climate Change Adaptation (ICAR/02)	6
Coastal Engineering (ICAR/01)	6

Table 3

Natural and technological risks in civil engineering	3
Planning buildings, co-ordination and safety on building sites	3
Fundamentals of transportation : transport planning	3
Maintenance, repair and renforcement of constructions	3
Timber constructions	3
Non linear finite elements	3
Seismic engineering	3
Fire safety engineering	3
Offshore Wind Structures	3
CFD applied to civil engineering	3

Curriculum "Infrastructure Design in River Basins" @UNIBO - Professional Focus "Civil Engineering" @ULiège

First year

UNIBO		ULiège	
Advanced Structural Mechanics (TAF B, SSD ICAR/08)	9	Structural analysis I	5
		Structural Analysis II	5
Geotechnical Engineering (TAF B, SSD ICAR/07)	6	Geotechnical Structures Conception and Execution	5
		Soils and Rocks mechanics	5
Numerical Methods (TAF C, SSD MAT/08)	12	Linear numerical methods in Civil and Geological Engineering	5
Advanced Design Of Structures (TAF B, SSD ICAR/09)	9	Concrete and new Materials Technologies	5
		Prestressed concrete structures and masonry	5
		Metallic and Steel-Concrete composite Structures	5
Advanced Hydrosystems Engineering (TAF B, SSD ICAR/02)	9	Fluvial hydrodynamics	5
Sustainable Transport System Design (TAF B, SSD ICAR/05)	9	Free surface flow	5
		Design and execution of hydraulic navigation structures	5
Design Project (TAF F)	6	Buildings conception and execution	5
	60		**60**

Second year

UNIBO		ULiège	
Managing engineering and construction processes (TAF C, SSD ING-IND/35)	6	Principles of management	5
Preparation for the Final Examination Abroad (TAF E)	12	Master Thesis	25
Final Examination (TAF E)	6		
4 Elective courses - TAF B from Table 1	24	Design and execution of dams and water networks	3
2 Courses freely chosen by the student - TAF D from Table 2	12	Road infrastructure conception and execution	3
		Bridges Conception and Execution	3
		Integrated project	7
		5 Courses freely chosen by the student from Table 3	15
	60		**61**

Table 1

Applied Geomatics (ICAR/06)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Sustainable Road Infrastructures (ICAR/04)	6
Large-Scale Water Structures (ICAR/02)	6
Climate Change Adaptation (ICAR/02)	6

Table 2

Applied Geomatics (ICAR/06)	6
DESIGN OF FOUNDATIONS AND RETAINING STRUCTURES (ICAR/07)	6
Design of Large-Scale Structures (ICAR/09)	6
Engineering Geology (GEO/05)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Mechanics of Historical Masonry Structures (ICAR/08)	6
Road Safety Engineering (ICAR/04)	6
Science and Technology of Composite Materials M (ING-IND/22)	6
Structural Safety (ICAR/09)	6
Structural Strengthening & Rehabilitation (ICAR/09)	6
Sustainable Building Design (ICAR/10)	6
Sustainable Road Infrastructures (ICAR/04)	6
Biotechnology for the Sustainable Reclamation of Contaminated Lands and Waters (ICAR/03)	6
Building Information Modeling (ICAR/17)	6
Computational Mechanics (ICAR/08)	6
Earthquake Engineering (ICAR/09)	6
Large-Scale Water Structures (ICAR/02)	6
Public Procurement (IUS/10)	6
Sustainability In Construction (ICAR/09)	6
Climate Change Adaptation (ICAR/02)	6
Coastal Engineering (ICAR/01)	6

Table 3

Natural and technological risks in civil engineering	3
Planning buildings, co-ordination and safety on building sites	3
Fundamentals of transportation : transport planning	3
Maintenance, repair and renforcement of constructions	3
Timber constructions	3
Non linear finite elements	3
Seismic engineering	3
Fire safety engineering	3
Offshore Wind Structures	3
CFD applied to civil engineering	3

Curriculum "Infrastructure Design in River Basins" @UNIBO - Professional Focus "Urban and Environmental Engineering" @ULiège

First year

UNIBO		ULiège	
Advanced Structural Mechanics (TAF B, SSD ICAR/08)	9	Structural analysis I	5
		Structural Analysis II	5
Geotechnical Engineering (TAF B, SSD ICAR/07)	6	Geotechnical Structures Conception and Execution	5
		Soils and Rocks mechanics	5
Numerical Methods (TAF C, SSD MAT/08)	12	Linear numerical methods in Civil and Geological Engineering	5
Advanced Design Of Structures (TAF B, SSD ICAR/09)	9	Concrete and new Materials Technologies	5
		Prestressed concrete structures and masonry	5
		Metallic and Steel-Concrete composite Structures	5
Advanced Hydrosystems Engineering (TAF B, SSD ICAR/02)	9	Fluvial hydrodynamics	5
Sustainable Transport System Design (TAF B, SSD ICAR/05)	9	Free surface flow	5
		Design and execution of hydraulic navigation structures	5
Design Project (TAF F)	6	Buildings conception and execution	5
	60		**60**

Second year

UNIBO		ULiège	
Managing engineering and construction processes (TAF C, SSD ING-IND/35)	6	Principles of management	5
Preparation for the Final Examination Abroad (TAF E)	12	Master Thesis	25
Final Examination (TAF E)	6		
4 Elective courses - TAF B from Table 1	24	Water and energy in urban environments	5
2 Courses freely chosen by the student - TAF D from Table 2	12	Land rehabilitation in urban environments	5
		Urban resilience	5
		Urban planning and transportation	5
		Urban sociology and co-design	2
		Introduction to urban GIS	3
		UEE integrated project	5
	60		**60**

Table 1

Applied Geomatics (ICAR/06)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Sustainable Road Infrastructures (ICAR/04)	6
Large-Scale Water Structures (ICAR/02)	6
Climate Change Adaptation (ICAR/02)	6

Table 2

Applied Geomatics (ICAR/06)	6
Design of Large-Scale Structures (ICAR/09)	6
Engineering Geology (GEO/05)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Mechanics of Historical Masonry Structures (ICAR/08)	6
Road Safety Engineering (ICAR/04)	6
Science and Technology of Composite Materials M (ING-IND/22)	6
Structural Safety (ICAR/09)	6
Structural Strengthening & Rehabilitation (ICAR/09)	6
Sustainable Road Infrastructures (ICAR/04)	6
Biotechnology for the Sustainable Reclamation of Contaminated Lands and Waters (ICAR/03)	6
Building Information Modeling (ICAR/17)	6
Computational Mechanics (ICAR/08)	6
Earthquake Engineering (ICAR/09)	6
Large-Scale Water Structures (ICAR/02)	6
Public Procurement (IUS/10)	6
Sustainability In Construction (ICAR/09)	6
Climate Change Adaptation (ICAR/02)	6
Coastal Engineering (ICAR/01)	6
Design, Monitoring and Management of Airport and Railway (ICAR/04)	6
Road Infrastructure Sustainable and Safe Management (ICAR/04)	6
Survey and Monitoring of Transport Infrastructures (ICAR/06)	6
Sustainable Building Design (ICAR/10)	6
Transport System Design and Planning (ICAR/05)	6
Circular-Green Management of Urban Drainage (ICAR/02)	6
Green Systems Design for Resilient Mobility Infrastructure (AGR/10)	6
Sustainable and Integrated Urban Transit Solutions (ICAR/05)	6

Curriculum "Sustainable Mobility in Urban Areas" @UNIBO - Professional Focus "Urban and Environmental Engineering" @ULiège

First year

UNIBO		ULiège	
Advanced Structural Mechanics (TAF B, SSD ICAR/08)	9	Structural analysis I	5
		Structural Analysis II	5
Geotechnical Engineering (TAF B, SSD ICAR/07)	6	Geotechnical Structures Conception and Execution	5
		Soils and Rocks mechanics	5
Numerical Methods (TAF C, SSD MAT/08)	12	Linear numerical methods in Civil and Geological Engineering	5
Advanced Design Of Structures (TAF B, SSD ICAR/09)	9	Concrete and new Materials Technologies	5
		Prestressed concrete structures and masonry	5
		Metallic and Steel-Concrete composite Structures	5
Advanced Hydrosystems Engineering (TAF B, SSD ICAR/02)	9	Fluvial hydrodynamics	5
Sustainable Transport System Design (TAF B, SSD ICAR/05)	9	Free surface flow	5
		Design and execution of hydraulic navigation structures	5
Design Project (TAF F)	6	Buildings conception and execution	5
	60		**60**

Second year

UNIBO		ULiège	
Managing engineering and construction processes (TAF C, SSD ING-IND/35)	6	Principles of management	5
Preparation for the Final Examination Abroad (TAF E)	12	Master Thesis	25
Final Examination (TAF E)	6		
4 Elective courses - TAF B from Table 1	24	Water and energy in urban environments	5
2 Courses freely chosen by the student - TAF D from Table 2	12	Land rehabilitation in urban environments	5
		Urban resilience	5
		Urban planning and transportation	5
		Urban sociology and co-design	2
		Introduction to Urban GIS	3
		UEE intregrated project	5
	60		**60**

Table 1

Design, Monitoring and Management of Airport and Railway (ICAR/04)	6
Road Infrastructure Sustainable and Safe Management (ICAR/04)	6
Survey and Monitoring of Transport Infrastructures (ICAR/06)	6
Transport System Design and Planning (ICAR/05)	6
Circular-Green Management of Urban Drainage (ICAR/02)	6
Sustainable and Integrated Urban Transit Solutions (ICAR/05)	6

Table 2

Applied Geomatics (ICAR/06)	6
Design of Large-Scale Structures (ICAR/09)	6
Engineering Geology (GEO/05)	6
Flood and Drought Risk Management (ICAR/02)	6
Groundwater and Contamination Processes (ICAR/01)	6
Mechanics of Historical Masonry Structures (ICAR/08)	6
Road Safety Engineering (ICAR/04)	6
Science and Technology of Composite Materials M (ING-IND/22)	6
Structural Safety (ICAR/09)	6
Structural Strengthening & Rehabilitation (ICAR/09)	6
Sustainable Road Infrastructures (ICAR/04)	6
Biotechnology for the Sustainable Reclamation of Contaminated Lands and Waters (ICAR/03)	6
Building Information Modeling (ICAR/17)	6
Computational Mechanics (ICAR/08)	6
Earthquake Engineering (ICAR/09)	6
Large-Scale Water Structures (ICAR/02)	6
Public Procurement (IUS/10)	6
Sustainability In Construction (ICAR/09)	6
Climate Change Adaptation (ICAR/02)	6
Coastal Engineering (ICAR/01)	6
Design, Monitoring and Management of Airport and Railway (ICAR/04)	6
Road Infrastructure Sustainable and Safe Management (ICAR/04)	6
Survey and Monitoring of Transport Infrastructures (ICAR/06)	6
Sustainable Building Design (ICAR/10)	6
Transport System Design and Planning (ICAR/05)	6
Circular-Green Management of Urban Drainage (ICAR/02)	6
Green Systems Design for Resilient Mobility Infrastructure (AGR/10)	6
Sustainable and Integrated Urban Transit Solutions (ICAR/05)	6

ANNEX B - dual degree programme "environmental engineering"

First year

UNIBO		ULg	
Circular economy: basics and implications	6	Analytical Chemistry I - Chemical analysis methods, Theory	2
Global environmetal law	6	Analytical chemistry II - Physicochemical techniques of analysis, Part A	3
Numerical Methods	6	Rocks and sedimentary processes (partie 1) - [4h Laboratory work]	2
Resources and recycling	9	Geology of Wallonia - [6d Field work]	3
Laboratory of environmental engineering and energy economics	3	Geological imaging and remote sensing (30h proj)	5
Industrial ecology	9	Rock mechanics, tunnels, rock slopes, rock foundations - [1d Field work, 50h project]	5
Sustainable design of water resources systems	6	Geostatistics (English language) - [30h Laboratory work]	5
Biotechnology for the sustainable reclamation of contaminated lands and waters	6	Geological mapping	5
Political economy of industry and development	6	4 courses from Table 4 or 4 courses from table 5	20
		2 courses freely chosen by the student from Table 4 to 7	10
	57		**60**

UNIBO students complete 57 credits during the first year@UNIBO and 63 credits during the second year @Ulg

ULg students complete 60 credits during the first year@ULg and 60 credits during the second year @UNIBO

Second year

UNIBO		ULg	
Preparation for the Final Examination Abroad	12	Master Thesis	20
Final Examination	6	Internship	5
		Principles of management (English language)	5
6 courses from Tables 1-2	33	4 courses freely chosen by the student from Tables 4 to 7	20
2 courses freely chosen by the student from Table 3	12		10
		2 courses from table 4 or 2 courses from table 5	
	63		**60**

UNIBO students complete 57 credits during the first year@UNIBO and 63 credits during the second year @Ulg (Table 4-5-6)

ULg students complete 60 credits during the first year@ULg and 60 credits during the second year @UNIBO

Table 1 Anthropogenic Landscapes Engineering group

Engineering Geology	6
Applied Geomatics	6
Modeling and management of natural hydraulic systems	6
Smart and sustainable water management	6
Geotechnical engineering for land protection	6
Applied geophysics	3

Table 2 Raw materials and Energy Transition Engineering group

Petroleum geosystems	6
Geostatistics and environmental modelling	6
Carbon capture and storage technologies	6
Clean technologies for energy transition	6
Mineral production systems	6
Applied geophysics	3

Table 3 Elective courses

Applied geomatics	6
Applied geophysics	3
Biopolymers chemistry	6
Biotechnology for the sustainable reclamation of contaminated lands and waters	6
Carbon capture and storage technologies	6
Clean technologies for energy transition	6
Coastal engineering	6
Computational mechanics	6
Computational mechanics m	6
Ecology	6
Engineering geology	6
Flood and drought risk management	6
Geostatistics and environmental modelling	6
Geotechnical engineering for land protection	6
Groundwater and contamination processes	6
Laboratory of materials characterization	6
Laboratory of photocatalysis	6
Large-scale water and wastewater structures	6
Managing engineering and construction processes	6
Mineral production systems	6
Modeling and management of natural hydraulic systems	6
Petroleum geosystems	6
Polymer science, technology and recycling	6
Public procurement	6
Smart and sustainable water management	6
Sustainability in construction	6
Sustainable road infrastructures	6
Sustainable urban design and planning workshop	12

Table 4 Mineral resources and recycling focus

Analytic mineralogy - [15 h Labo.]	5
Solid Waste and by products processing - [20 h Labo.,7 h Proj.,1.5 j T. t.]	5
Exploitation of mineral deposits - [2 j T. t.]	5
Process mineralogy - [25 h Labo.,15 h Proj.]	5
Extractive metallurgy - [1 j T. t.]	5
Raw materials in a circular economy - [1 j T. t.]	5

Table 5 Environmental and geological engineering focus

Groundwater modelling - [30 h Labo.,30 h Proj.]	5
Site investigation - [40 h Labo.,40 h Proj.,5 j T. t.]	5
Geothermy - [40 h Proj.,1 j T. t.]	5
Groundwater quality and protection - [35 h Proj.,1 j T. t.]	5
Remediation of contaminated sites - [40 h Proj.,2 j T. t.]	5
Environmental geotechnics - [10 h Labo.,15 h Proj.,1 j T. t.]	5

Table 6 Urban and environmental engineering focus

Water and energy in urban environment - [2 j T. t.]	5
Land rehabilitation in urban environments - [10 h Labo.,20 h Proj.,2 j T. t.]	5
Urban planning and transportation - [1 j T. t.]	5
Urban sociology and co-design - [20 h Proj.,1 j T. t.]	2
UEE Integrated Project - [100 h Proj.,1 j T. t.]	5
Introduction to Urban GIS	3

Table 7 Elective courses

Linear numerical methods in Civil and Geological Engineering - [30 h Proj.]	5
Hydrocarbons in the energy transition, Geology applied to the exploration of hydrocarbons (Even years)	2
Unconventional hydrocarbons in the energy transition (Even years)	3
Building Materials - [12 h Labo.,12 h Proj.,0.5 j T. t.]	5
Tectonics	5
Partim A	-
Field work - [2 j T. t.]	-
High Temperature Processes in Recycling & Remanufacturing - [1 j T. t.]	5
Introduction to the modelling of chemical processes	5
Project - [10 h Labo.,90 h Proj.,4 j T. t.]	5
Geophysical prospecting - [20 h Proj.,5 j T. t.]	5
Mineral resources - [26 h Labo.,32 h Proj.,1 j T. t.]	5
Geological hazard and risk assessment - [20 h Proj.,2 j T. t.]	5
Hydrogeology - [10 h Proj.,1 j T. t.]	5
Geotechnics and infrastructure - [2 h Labo.,0.5 j T. t.]	5
Mineral processing I - basics - [30h h Labo.,10h h Proj.,1.5h j T. t.]	5
Complement of geology	5
Part 1 : Elements of mineralogy	-
Part 2 : Elements of magmatic and metamorphic petrology	-
Environmental impact of industrial and mining activities - [25 h Labo.,5 h Proj.,1 j T. t.]	5
Economic and societal issues in mining and recycling - [30 h Proj.,2 j T. t.]	5
Scientific research in engineering and its impact on innovation	5
Project in inverse modelling : from field to algorithms (30h proj, 4JTT)	5

ANNEX C TO THE AGREEMENT OF COOPERATION FOR THE GRANTING OF DUAL DEGREES

Responsible for scientific and teaching aspects

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