

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

### 1. Dual Degree programs activated under the Agreement

Each Dual Degree program 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 Miami. The Agreement applies to Master programs listed in Table 1. Reference Departments at each institution for the Dual Degree programs are Department of Civil, Chemical, Environmental and Materials Engineering (DICAM) at UNIBO and Department of Civil, Architectural and Environmental Engineering (CAE) at UM.

**Table 1: Dual Degree Programs activated under the agreement**

<b>Dual Degree Program</b>	<b>Academic Degree obtained at UNIBO</b>	<b>Academic Degree obtained at UM</b>
CIVIL ENGINEERING	Laurea Magistrale in Civil Engineering (Classe LM 23) - taught in English	MS in Civil Engineering
ENVIRONMENTAL ENGINEERING	Laurea Magistrale in Ingegneria per l'Ambiente ed il Territorio (Classe LM 35) – “Earth Resources Engineering” International Curriculum - taught in English	MS in Civil Engineering (Environmental emphasis)

Only the students enrolled in the above listed 4+1 (BS+MS) programs at UM will be offered the opportunity to participate in the pertinent Dual Degree program, which will enable them to register in the Laurea Magistrale at the University of Bologna, as indicated in Table 1. The students enrolled in the Lauree Magistrali at UNIBO will be offered the opportunity to participate in the pertinent Dual Degree program, which will enable them to enroll in the Master of Science at UM, as indicated in Table 1. Upon completion of Dual Degree program, 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 program are listed in Table 1.

The study programs and the list of courses that the students enrolled in the Dual Degree program must complete are listed in the following paragraphs. Modifications to the study program may be made by mutual consent of the Program Coordinators appointed by Article 7 of the Agreement.

### 2. General conditions for all the study programs

The following conditions apply to all study programs.

If pertinent, by selecting the technical electives, denoted by “curriculum courses”, the students may focus on one of various areas of concentration where present. The study plans together with the list of curriculum courses at both parties are reported below.

In addition, the students must select “elective courses” to add up to the prescribed number of credits according to the study program. Elective courses may be selected among all the courses offered by the host institution, but students are recommended to select them among the degree courses.

Candidate students may submit an individual study program to anticipate some courses and to select elective courses that are not listed among curriculum courses. In exceptional cases, some courses may be substituted, upon valid motivation, according to individual study program. In any case, the individual study program must be approved by both parties.

As indicated in Articles 5.3, to obtain the Laurea Magistrale at UNIBO, students must defend their Master's Thesis, according to the rules and modalities of UNIBO. For each Master's program, the specific modules where the Master's Thesis will be prepared are indicated in the following paragraphs.

### **3. Mobility structure**

Enrolled student who want attend the Dual Degree program will have to select one of the following paths:

- First year at University of Bologna (60 ECTS – 30 U.S. credits) and second year at the University of Miami (60 ECTS or 30 U.S. credits). To conclude the program, the student will have to defend the Master Thesis (Tesi di Laurea Magistrale).
- First year at the University of Miami (60 ECTS – 30 U.S. credits), second year at University of Bologna (60 ECTS – 30 U.S. credits). After completing the study plan, the student must fulfill the obligations at University of Bologna to defend the Master Thesis and obtain the Master Degree.

The structures of the study programs related to the paths described above are detailed in the following, separately for the two Dual Degree Programs (Civil Engineering and Environmental Engineering).

Other study programs can be followed, after approval by relevant academic bodies of the Parties

### **DUAL DEGREE IN CIVIL ENGINEERING**

The study program and corresponding courses offered at University of Bologna and the University of Miami are listed below.

#### **UM Students**

*Senior year at UM: all the courses in Table A (24 U.S., 48 ECTS) + 2 courses in Tables B and C (6 U.S., 12 ECTS)*

*Second year at UNIBO: the remaining courses in Tables B and C (24 U.S., 48 ECTS) + course in Table D (9 U.S., 18 ECTS)*

#### **UNIBO Students**

*First year at UNIBO: all the courses in Table A (24 U.S., 48 ECTS) + the first course in Tables B (6 U.S., 12 ECTS)*

*Second year at UM: the remaining courses in Tables B and C (24 U.S., 48 ECTS) + course in Table D (9 U.S., 18 ECTS)*

At UNIBO, the student must choose one of the two curricula.

*Curricula courses* - The curricula courses offered for Structural Engineering and Infrastructure design in river basins curricula are listed in Tables E and F, respectively.

*Elective courses* - The student must choose two elective courses among the courses of Tables E, F and G.

Each student must prepare a study plan specifying the courses selected to obtain the Degree.

**TABLE A**

<b>UM</b>		<b>UNIBO</b>	
CAE 450 Transportation Engineering II	3	INFRASTRUCTURE SYSTEMS	9
CAE 530 Water Resources Engineering II	3	ADVANCED HYDROSYSTEMS ENGINEERING	9
CAE 470 Foundations & Earth Retaining Systems	3		
CAE 520 Adv. Design of Concrete Structures	3		
<i>and 2 courses among the following:</i>			
CAE 511 Adv. Structural Analysis	3	ADV. DESIGN OF STRUCTURES	9
CAE 521 Adv. Design of Steel Structures	3	ADV. STRUCTURAL MECHANICS	9
MAE 507 Adv. Mechanics of Solids	3		
CAE 611 Theory of Elasticity	3		
CAE 603 Master Design Projects I	3	DESIGN PROJECTS	6
CAE 570 Foundation Engineering	3	GEOTECHNICAL ENGINEERING	6

**TABLE B**

<b>UM</b>		<b>UNIBO</b>	
MAE 501 Methods of Engineering Analysis	3	NUMERICAL METHODS	12
MAE 605 Finite Element Methods	3		
CAE 460 Construction Management	3	MANAGING ENGINEERING AND CONSTRUCTION PROCESSES	6

**TABLE C**

<b>UM</b>		<b>UNIBO</b>	
Curriculum course	3	CURRICULUM COURSE	6
Curriculum course	3	CURRICULUM COURSE	6
Curriculum course	3	CURRICULUM COURSE	6
Curriculum course	3	CURRICULUM COURSE	6
Elective course	3	ELECTIVE COURSE	6
Elective course	3	ELECTIVE COURSE	6

**TABLE D**

<b>UM</b>		<b>UNIBO</b>	
CAE 402 Professional Engineering Practice	3	Final Examination	6
CAE 710 Master's Thesis	6	Preparation for the Final Examination Abroad	12

**TABLE E**

<b>Curriculum 1 - Structural Engineering</b>	<b>ECTS</b>
MECHANICS OF HISTORICAL MASONRY STRUCTURES	6
STRUCTURAL SAFETY	6
STRUCTURAL STRENGTHENING & REHABILITATION	6
COMPUTATIONAL MECHANICS	6
EARTHQUAKE ENGINEERING	6

**TABLE F**

<b>Curriculum 2 - Infrastructure design in river basins</b>	<b>ECTS</b>
APPLIED GEOMATICS	6
FLOOD AND DROUGHT RISK MANAGEMENT	6
GROUNDWATER AND CONTAMINATION PROCESSES	6
LARGE-SCALE WATER AND WASTEWATER STRUCTURES	6
SUSTAINABLE DESIGN OF WATER RESOURCES SYSTEMS	6
SUSTAINABLE ROAD INFRASTRUCTURES	6

**TABLE G**

<b>Additional Courses</b>	<b>ECTS</b>
ENGINEERING GEOLOGY	6
SCIENCE AND TECHNOLOGY OF COMPOSITE MATERIALS	6
SUSTAINABILITY IN CONSTRUCTION	6
BIOTECHNOLOGY FOR THE SUSTAINABLE RECLAMATION OF CONTAMINATED LANDS AND WATERS	6

The discussion of the Master Thesis will take place in Bologna.

### **DUAL DEGREE IN ENVIRONMENTAL ENGINEERING**

The study program and corresponding course offered at University of Bologna and University of Miami are listed below.

The study program and correspondence of courses offered at University of Bologna and the University of Miami are listed below.

#### **UM Students**

*Senior year at UM:* all the courses in Table A (24 U.S., 48 ECTS) + 2 courses in Table B (6 U.S., 12 ECTS)

*Second year at UNIBO:* the remaining course in Table B (3 U.S., 6 ECTS) + all the courses in Table C (21 U.S., 42 ECTS) + the course in Table D (6 U.S., 12 ECTS)

#### **UNIBO Students**

*First year at UNIBO:* all the courses in Table A (24 U.S., 48 ECTS) + the first two courses in Tables B (6 U.S., 12 ECTS)

*Second year at UM:* the remaining courses in Tables B and C (24 U.S., 48 ECTS) + course in Table D (6 U.S., 12 ECTS)

*Elective courses* - The student must choose two elective courses among the courses offers by the Master Degree of the hosting University.

Each student must prepare a study plan specifying the courses selected to obtain the Degree.

**TABLE A**

<b>UM</b>		<b>UNIBO</b>	
CAE542 Solid and Hazardous Waste Engineering	3	APPLIED GEOMATICS M	6
CAE430 Water-Resources Engineering I	3	ADVANCED HYDROSYSTEMS ENGINEERING M	9
CAE 530 Water Resources Engineering II	3	ENGINEERING GEOLOGY M	6
CAE540 Environmental Chemistry Processes	3	INDUSTRIAL AND ENVIRONMENTAL SAFETY M	9
CAE440 Water Quality Control Systems	3	GEOTECHNICAL ENGINEERING	6
CAE533 Water Quality Control in Natural Systems	3		
CAE 603 Master Design Projects I	3	LABORATORY OF ENVIRONMENTAL ENGINEERING AND ENERGY ECONOMICS	3
		LABORATORY ON RENEWABLE RAW MATERIALS AND CIRCULAR ECONOMY	3
CAE 402 Professional Engineering Practice	3	ENV ENGINEERING RESEARCH A	6
tot	24	tot	48

**TABLE B**

<b>UM</b>		<b>UNIBO</b>	
MAE 501 Methods of Engineering Analysis	3	INTRODUCTION TO NUMERICAL METHODS I	6
CAE541 Environmental Microbiology	3	BIOTECHNOLOGY FOR THE SUSTAINABLE RECLAMATION OF CONTAMINATED LANDS AND WATERS M	6
CAE 570 Foundation Engineering	3	RESOURCES AND RECYCLING M	6

**TABLE C**

<b>UM</b>		<b>UNIBO</b>	
CAE542 Solid and Hazardous Waste Engineering	3	INDUSTRIAL ECOLOGY M	6
CAE532 Ground-Water Hydrology	3	MINERALS PRODUCTION SYSTEMS M	6
CAE540 Environmental Chemistry Processes	3	PETROLEUM GEOSYSTEMS M	6
CAE631 Wastewater Treatment and System Design	3	WATER ENGINEERING (Flood and Drought Risk Management & Groundwater and Contamination Processes)	12
CAE530 Water-Resources Engineering II	3		
CAE531 Surface-Water Hydrology	3	ELECTIVE COURSE	6
Electives Courses	6	ELECTIVE COURSE	6

**TABLE D**

<b>UM</b>		<b>UNIBO</b>	
CAE 710 Master's Thesis	6	ENV ENG. RESEARCH B	12

The discussion of the Master Thesis will take place in Bologna.