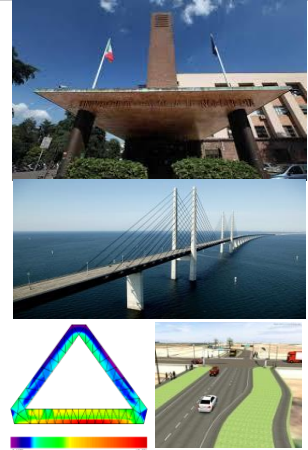




The international Master's in Civil Engineering is a graduate programme (Laurea Magistrale) that aims at educating professionals with the necessary in-depth scientific and technical knowledge in the field of civil engineering.

The programme is intended to provide students with firm technical bases while nurturing decision-making and leadership potential. It prepares graduates to practice their profession at an advanced level and with a unique exposure to an international environment to better understand global issues of civil engineering.



Admissions

Read the Call for Applications on the website for detailed information on deadlines, registration rules and scholarship opportunities. A first cycle title and a B2 level English proficiency are required.

About the programme: Civil Engineering

All courses and activities are given in English. The master's duration is two years (4 semesters/120 ECTS). The core modules, common for all students, aim at consolidating fundamentals and improving modelling capabilities in the classical areas of Civil Engineering such as structural mechanics and engineering, hydraulics and hydrology, soil mechanics, road design and transportation.

In the second year, students choose a curriculum amongst:

- Infrastructure design in river basins (Bologna);
- Structural engineering (Bologna);
- Off-shore engineering (Ravenna).

These will allow students to become skilled in civil engineering project-management, in design and analysis of civil-engineering structures and infrastructures, providing a comprehensive know how on civil engineering materials, technologies and processes. Students will receive help to build their own curriculum. Students must also discuss a final dissertation.

The courses will be organized with in-class teaching activities, practice, design and laboratory activities. The final exam consists in the public discussion of a dissertation (the master thesis).

Even more international

Thanks to Dual Degree agreements, students can obtain two qualifications in two years. The partners are Columbia University (New York, USA); University of Miami (Florida, USA); Université de Liège (Belgium).

Furthermore, international agreements allow students to spend part of their studies abroad (for exams, research, or internships).

About the curriculum: Structural Engineering

Mission: to provide a comprehensive education and training on structural systems using a holistic approach in which the roles of materials, mechanics, analysis and design are emphasized.

Objectives:

- to apply fundamental principles and standards within the Civil engineering fields;
- to provide a strong technical education and broad multi-disciplinary skills to embark on successful professional careers in public enterprises, industry or academia;
- to understand the ethical issues pertaining to engineering, and develop appropriate communication and collaboration skills essential for professional practice.

Outcomes:

- ability to identify, formulate, and solve Civil engineering problems;
- ability to design and conduct experiments, as well as to analyze and interpret data;
- ability to use modern engineering techniques and computing tools necessary for the engineering practice;
- ability to communicate effectively with written, oral, and visual means and to function in multi-disciplinary teams.

Structural Engineering

First Year		SSD (scientific sector)	ECTS
Mandatory courses			
72756	ADVANCED DESIGN OF STRUCTURES	ICAR/09	9
72757	ADVANCED HYDROSYSTEMS ENGINEERING	ICAR/02	9
72758	ADVANCED STRUCTURAL MECHANICS	ICAR/08	9
66788	CIVIL ENGINEERING RESEARCH A		6
72765	GEOTECHNICAL ENGINEERING	ICAR/07	6
72763	INFRASTRUCTURE SYSTEMS	ICAR/05	9
72764	NUMERICAL METHODS	MAT/08	12
Second year			
		SSD (scientific sector)	ECTS
Mandatory courses			
66789	CIVIL ENGINEERING RESEARCH B		12
72761	DESIGN PROJECTS		6
72767	MANAGING ENGINEERING AND CONSTRUCTION PROCESSES	ING-IND/35	6
Elective courses (24 ECTS)			
72769	COMPUTATIONAL MECHANICS	ICAR/08	6
75204	DESIGN OF LARGE-SCALE STRUCTURES	ICAR/09	6
72781	EARTHQUAKE ENGINEERING	ICAR/09	6
72782	MECHANICS OF HISTORICAL MASONRY STRUCTURES	ICAR/08	6
72785	STRUCTURAL SAFETY	ICAR/09	6
72789	STRUCTURAL STRENGTHENING & REHABILITATION	ICAR/09	6
Courses freely chosen by the student (12 ECTS)			
72794	APPLIED GEOMATICS	ICAR/06	6
72803	BIOTECHNOLOGY FOR THE SUSTAINABLE RECLAMATION OF CONTAMINATED LANDS AND WATERS	ICAR/03	6
72805	ENGINEERING GEOLOGY	GEO/05	6
78594	FLOOD AND DROUGHT RISK MANAGEMENT	ICAR/02	6
78593	GROUNDWATER AND CONTAMINATION PROCESSES	ICAR/01	6
78647	LARGE-SCALE WATER AND WASTEWATER STRUCTURES	ICAR/02	6
78965	PUBLIC PROCUREMENT	IUS/10	6
78595	ROAD SAFETY ENGINEERING	ICAR/04	6
72807	SCIENCE AND TECHNOLOGY OF COMPOSITE MATERIALS M	ING-IND/22	6
72748	SUSTAINABILITY IN CONSTRUCTION	ICAR/09	6
78737	SUSTAINABLE BUILDING DESIGN	ICAR/10	6
78596	SUSTAINABLE DESIGN OF WATER RESOURCES SYSTEMS	ICAR/02	6
81509	SUSTAINABLE ROAD INFRASTRUCTURES	ICAR/04	6

About the curriculum: Infrastructure Design in River Basins

The curriculum focuses on the management of water resources and river basins in a human-impacted environment through:

- the analysis of the hydrological, geological, geomorphological and socio-economical behaviour of the catchment area;
- the monitoring, understanding and management of surface water and ground water resources, keeping into consideration the impact and feedback of human interventions on these systems;
- the design and management of water systems and hydraulic structures, their characteristics and functioning in relation to other civil engineering infrastructures (such as transportation systems).

Students will become able to make appropriate and critical use of methods, techniques and tools necessary for planning the integrated management of water resources and water systems in river basins, for designing engineering structures and infrastructures (aimed at water supply, drainage and defense from water-related risks), together with the accompanying maintenance and operational control practices.

Graduates may set to work as advisors, designers or project leaders and take up careers with consultancies, contractors, water utilities, water boards or regulatory bodies, relief agencies and international organisations.

disciplinary skills to embark on successful professional careers in public enterprises, industry or academia;

- to understand the ethical issues pertaining to engineering, and develop appropriate communication and collaboration skills essential for professional practice.

Outcomes:

- ability to identify, formulate, and solve Civil engineering problems;
- ability to design and conduct experiments, as well as to analyze and interpret data;
- ability to use modern engineering techniques and computing tools necessary for the engineering practice;
- ability to communicate effectively with written, oral, and visual means and to function in multi-disciplinary teams.

Infrastructure Design in River Basins

First Year		SSD (scientific sector)	ECTS
Mandatory courses			
72756	ADVANCED DESIGN OF STRUCTURES	ICAR/09	9
72757	ADVANCED HYDROSYSTEMS ENGINEERING	ICAR/02	9
72758	ADVANCED STRUCTURAL MECHANICS	ICAR/08	9
66788	CIVIL ENGINEERING RESEARCH A		6
72765	GEOTECHNICAL ENGINEERING	ICAR/07	6
72763	INFRASTRUCTURE SYSTEMS	ICAR/05	9
72764	NUMERICAL METHODS	MAT/08	12
Second year			
		SSD (scientific sector)	ECTS
Mandatory courses			
66789	CIVIL ENGINEERING RESEARCH B		12
72761	DESIGN PROJECTS		6
72767	MANAGING ENGINEERING AND CONSTRUCTION PROCESSES	ING-IND/35	6
Elective courses (24 ECTS)			
72794	APPLIED GEOMATICS	ICAR/06	6
78594	FLOOD AND DROUGHT RISK MANAGEMENT	ICAR/02	6
78593	GROUNDWATER AND CONTAMINATION PROCESSES	ICAR/01	6
78647	LARGE-SCALE WATER AND WASTEWATER STRUCTURES	ICAR/02	6
78596	SUSTAINABLE DESIGN OF WATER RESOURCES SYSTEMS	ICAR/02	6
81509	SUSTAINABLE ROAD INFRASTRUCTURES	ICAR/04	6
Courses freely chosen by the student (12 ECTS)			
72803	BIOTECHNOLOGY FOR THE SUSTAINABLE RECLAMATION OF CONTAMINATED LANDS AND WATERS	ICAR/03	6
72797	COASTAL ENGINEERING	ICAR/01	6
72769	COMPUTATIONAL MECHANICS	ICAR/08	6
75204	DESIGN OF LARGE-SCALE STRUCTURES	ICAR/09	6
72781	EARTHQUAKE ENGINEERING	ICAR/09	6
72805	ENGINEERING GEOLOGY	GEO/05	6
72782	MECHANICS OF HISTORICAL MASONRY STRUCTURES	ICAR/08	6
78965	PUBLIC PROCUREMENT	IUS/10	6
78595	ROAD SAFETY ENGINEERING	ICAR/04	6
72807	SCIENCE AND TECHNOLOGY OF COMPOSITE MATERIALS M	ING-IND/22	6
72785	STRUCTURAL SAFETY	ICAR/09	6
72789	STRUCTURAL STRENGTHENING & REHABILITATION	ICAR/09	6
72748	SUSTAINABILITY IN CONSTRUCTION	ICAR/09	6

About the curriculum: Off-shore Engineering

The programme, entirely delivered in English, is offered thanks to the support of companies in the Ravenna Off-Shore District and of Fondazione Flaminia.

The courses will delve into the themes of design, construction and management of Off-shore and maritime structures, starting from the action of the sea on constructions, and addressing fabrication techniques and structures assembling.

The first year of the programme will be delivered in Bologna, while the second year will be offered in Ravenna.

Thanks to an agreement between Confindustria and the University of Bologna, students attending the programme will be offered the possibility of carrying out an internship and to develop a Master's thesis in the companies operating in Ravenna.

Off-shore Engineering

First Year		SSD (scientific sector)	ECTS
Mandatory courses			
72756	ADVANCED DESIGN OF STRUCTURES	ICAR/09	9
72757	ADVANCED HYDROSYSTEMS ENGINEERING	ICAR/02	9
72758	ADVANCED STRUCTURAL MECHANICS	ICAR/08	9
66788	CIVIL ENGINEERING RESEARCH A		6
72765	GEOTECHNICAL ENGINEERING	ICAR/07	6
72763	INFRASTRUCTURE SYSTEMS	ICAR/05	9
72764	NUMERICAL METHODS	MAT/08	12
Second year			
		SSD (scientific sector)	ECTS
Mandatory courses			
66789	CIVIL ENGINEERING RESEARCH B		12
78491	DESIGN OF OFFSHORE STRUCTURES AND FOUNDATIONS	ICAR/09	9
78646	LABORATORY OF OFFSHORE O&G EXPLOITATION		3
78494	MODELLING OF OFFSHORE STRUCTURES	ICAR/08	6
78640	MONITORING AND POSITIONING IN OFF-SHORE ENGINEERING	ICAR/06	6
78638	OCEAN AND COASTAL ENGINEERING I.C.		
	78639 - OCEAN ENGINEERING	ICAR/01	6
	73365 - COASTAL ENGINEERING	ICAR/02	6
Courses freely chosen by the student (12 ECTS)			
78487	BIOREMEDIATION AND EXPLOITATION OF MARINE BIORESOURCES	ICAR/03	6
78642	CORROSION AND PROTECTION OF METALLIC OFFSHORE STRUCTURES	ING-IND/22	6
75385	INTERNSHIP		6
81510	LABORATORY OF OFFSHORE OPERATIONS		6
78486	OFFSHORE HSE MANAGEMENT	ING-IND/25	6
79031	OFFSHORE O&G RESOURCES EXPLOITATION	ING-IND/30	9
81511	PROJECT MANAGEMENT IN OFFSHORE ACTIVITIES	ING-IND/35	6
78493	TURBOMACHINES AND POWER GENERATION FOR OFF-SHORE APPLICATIONS	ING-IND/08	3

Syllabus

Code	Aims and objectives	Course (alph. order)
72756	Advanced methods for the verification and design of concrete structures will be given. The methods are based on the mechanics and simplified models for one- and two-dimensional concrete structures. A variety of civil engineering structures will be analysed. The advanced methods will be used to solve some real problems, with reference to European and US Codes and Guide Lines. The students will design some one- and two-dimensional structures under the supervision of the teacher.	ADVANCED DESIGN OF STRUCTURES
72757	A successful learner from this course will be able to: a) deal with the most actual and urgent hydraulic and environmental problems connected with water supplies and drainage systems; design and operate urban water systems, taking into account: i) advanced design procedures and technological findings; ii) environmental and economic issues; and iii) construction site aspects; the b) apply basic modelling and computational techniques for addressing reliability analysis and risk assessment in civil engineering, with special emphasis on the water sector.	ADVANCED HYDROSYSTEMS ENGINEERING
72758	The course is an extension and intensification of Mechanics of Solids and Structures. The goal of the course is to advance the understanding of structural behavior and enhance the ability to apply classical structural analysis methods to civil engineering systems. The advanced methods for the analysis of structures will be applied to some structural examples which will be developed by the students.	ADVANCED STRUCTURAL MECHANICS
72794	Through this course the student acquires knowledge to integrate modern surveying technologies offered by Geomatics for the metrical study of objects, sites, and territory in a consistent way. The student learns the use of space-geodetic techniques suitable for multi-scale measurements (global to local), and thus he is able to integrate in situ observations, airborne surveying and satellite imagery. 3D data acquisition and modeling is in particular discussed, either for environmental applications and for civil and architectural surveys.	APPLIED GEOMATICS
78487	The course will provide students with the knowledge of biochemistry, microbiology and bioprocessing required for the sustainable remediation of impacted marine ecosystems (surface and subsurface water and sediments) and the industrial exploitation of marine biodiversity and bioresources.	BIOREMEDIATION AND EXPLOITATION OF MARINE BIORESOURCES
72803	To provide the students with the basics for understanding the roles of microbial populations in natural and contaminated habitats and with the main microbial and technological aspects related the conduction and optimization of the prominent environmental biotechnological processes currently applied in the remediation of industrial wastewaters, sediments and sites contaminated by xenobiotic compounds.	BIOTECHNOLOGY FOR THE SUSTAINABLE RECLAMATION OF CONTAMINATED LANDS AND WATERS

Code	Aims and objectives	Course (alph. order)
66788	The course is aimed at introducing the student at some individual activities which will continue in the second year with the preparation of the final dissertation: the organization of a complex and integrated project in the field of civil engineering, or the state-of-art analysis of a research problem, selected at the beginning of the course.	CIVIL ENGINEERING RESEARCH A
66789	The course, initiated in the first year, continues with some individual activities concerning with the preparation of the final dissertation: the organization of a complex and integrated project in the field of civil engineering, or the state-of-art analysis of a research problem, selected at the beginning of the course.	CIVIL ENGINEERING RESEARCH B
72797	Aim of the course is to provide tools for static analysis and basic skills for the evaluation of coastal structures impact and design. The course will introduce and describe processes that characterize the oceanic and littoral environment and provide tools for the analysis and design of coastal defences, harbours and offshore structures. Observations and physical intuition for understanding physical processes are emphasized.	COASTAL ENGINEERING
73365	The course aims to provide tools and skills for the design and management of ocean structures, as well as the assessment of their impact. The course will introduce and describe the processes that characterize the oceanic environment and will provide tools for the analysis and design offshore structures and offshore approach facilities, and renewal energy plants. In particular the student will be able to analyze the sea conditions (waves, currents) and to design ocean structures, as offshore structures (TLP, spar buoys) and their interaction with waves. Attention will be dedicated to oil spill dispersion from offshore structures. The conversion of energy from the sea (waves and currents) will also be treated.	COASTAL ENGINEERING
72769	The course is an introduction to computational mechanics of solids and structures. The goal of the course is to provide the students with the fundamental concepts and operating tools to solve current structural problems using computer technology.	COMPUTATIONAL MECHANICS
78642	The aim of the course is to introduce the student to the metallic materials used for off-shore installations and equipment. Knowledge on construction technologies, corrosion protection and materials for the protection from fire will also be provided.	CORROSION AND PROTECTION OF METALLIC OFFSHORE STRUCTURES

Code	Aims and objectives	Course (alph. order)
75204	A successful learner from this course will be able to: understand the static and dynamic behavior of large-scale structures such as tall buildings, large convention centers and major sports stadiums; understand the complete design process from initial design concepts on through all the major design decisions to the completion of detailed design; model the loadings acting on large - scale structures, also when the latter may interact with the loading itself, such as in the case of wind in large buildings or bridges.	DESIGN OF LARGE-SCALE STRUCTURES
78491	The aim of the course is to provide for the basic and some advanced elements for design of offshore structures. After an extensive illustration of requirements and protocols for certification of steel for construction, the elements of design of steel structures will be given, including strength requirements, instability verification, design of connections (bolted and welded), with particular emphasis to those typical of off shore structures. Design criteria on more complex steel elements (tanks, pipes, plates, shell, etc) will be also given. Criteria for life extension of existing off shore platforms will be also given. Then, typologies of foundations for off shore structures will be illustrated, together with the design criteria for different kinds of grounds and loads to be transmitted.	DESIGN OF OFFSHORE STRUCTURES AND FOUNDATIONS
72761	In the course the students will develop a project concerning one of the subject covered in the courses of the 1st year. In particular, the student will develop a project in one of the following fields: structural, hydraulics, road and transportation. The project will be done by the student alone or in small groups, under the supervision of the instructor.	DESIGN PROJECTS
72781	In the course, the student will know the main aspects of earthquake engineering, and in particular: seismology and hazard, behaviour of structures under earthquake action, with elastic and inelastic behaviour, definition of the seismic action, design methods according to the most important Codes and regulations, detailing. The methods will be described with reference to reinforced concrete, steel and masonry structures.	EARTHQUAKE ENGINEERING
72805	Engineering Geology is aimed at studying the engineering and environmental problems which may arise as a result of the interaction between geology and human activities. The main goal of the course is to improve the knowledge of geological and geomorphological processes, developing skills in the analysis of their effects on civil engineering design.	ENGINEERING GEOLOGY

Code	Aims and objectives	Course (alph. order)
78594	<p>At the end of the course students have an understanding of the factors causing and aggravating both river floods and droughts, and a knowledge of the options and measures available for reducing and managing such risks. In particular, the course will provide advanced theoretical bases, knowledge of the tools and applied skills for (i) the assessment of flood and drought risk, in terms of hazard and vulnerability and (ii) the appraisal and design of measures for mitigating and managing such risks (such as structures for flood protection/mitigation, flood and droughts policies/plans/mapping; forecasting and managing flood and drought emergencies).</p>	<p>FLOOD AND DROUGHT RISK MANAGEMENT</p>
72765	<p>The course is aimed at providing students with advanced knowledge of soil mechanics and geotechnical modelling, with special emphasis on their applications to the design of civil engineering structures. On successful completion of the course, the student will: know the characteristics and peculiarities of soil behaviour, be able to determine and compare physical and mechanical soil parameters, learn skills and develop methods for the design of main geotechnical structures.</p>	<p>GEOTECHNICAL ENGINEERING</p>
78593	<p>The course provides fundamentals of subsurface flow and transport, emphasizing the primary role of groundwater in the hydrologic cycle, the relation of groundwater flow to hydrogeological properties, and the management of contaminated groundwater. Effective methods for the prediction and interpretation of groundwater processes will be discussed together with engineering implications. □</p> <p>These include basics of infrastructure design related to the subsurface environment. Particular attention will be reserved to well hydraulics having several implications in water exploitation, monitoring and remediation. Description and analysis of both synthetic and real case studies will provide the opportunity to jointly apply concepts and methods discussed during the course.</p>	<p>GROUNDWATER AND CONTAMINATION PROCESSES</p>

Code	Aims and objectives	Course (alph. order)
72763	The main goals of this course are: (i) to review and explain the theoretical foundations of methods that are necessary to understand, apply and evaluate the various scientific and technological approaches which claim to improve the sustainability of transportation; (ii) to present examples of the aforementioned approaches such as alternative fuels and propulsion methods, innovative transport systems, and various taxation schemes to include external costs and attempts to change awareness. A main purpose is to make students capable to analyzing critically the potential of new approaches to sustainable transportation, rather than to give a complete coverage of all known methods proposed to date. The student knows how to study the problems related with the vulnerability of road infrastructures, the risk analysis of in-ground constructions, the verification of existing roads and the design of new roads. He is also able to prepare maintenance plans and safety plans for roads and galleries.	INFRASTRUCTURE SYSTEMS
75385	At the end of the internship, the student has acquired experience in close contact with one of the professional fields of possible future employment.	INTERNSHIP
78646	At the end of the course the student has obtained knowledge on the exploitation principles of oil&gas reservoirs and on exploitation technologies.	LABORATORY OF OFFSHORE O&G
81510	The student will be introduced to the main construction and maintenance operations in off-shore activities with the aim of understanding the specificities required by off-shore operations.	LABORATORY OF OFFSHORE OPERATIONS
78647	The course provides advanced theoretical basis, knowledge of the tools and applied skills for: (1) the design of large scale wastewater systems, with particular emphasis on sewer systems and water supply systems for large cities; (2) the design of large dams, with particular emphasis on the estimation of the forcings, the design of dam's hydraulic facilities, the prevention and detection of leakage, and the design of large scale power plants. Student gain expertise on the hydraulic and management challenges of large scale infrastructures and their environmental impact. Case studies related to large scale sewer systems and recently built large scale dams are considered and provide the way forward through the learning of the concepts.	LARGE-SCALE WATER AND WASTEWATER STRUCTURES
72767	A successful learner from this course will know the principles, methods and tools necessary to manage design and construction processes, elements of planning, estimating, scheduling, bidding and contractual relationships, valuation of project cash flows, critical path method, survey of construction procedures, cost control and effectiveness, field supervision.	MANAGING ENGINEERING AND CONSTRUCTION PROCESSES

Code	Aims and objectives	Course (alph. order)
72782	The goal of the course is to provide the students with the fundamentals for the analysis of historical masonry structures. In particular, the course treats the theoretical aspects, the numerical tools and the experimental techniques for an effective structural diagnosis of historical structures aimed at preservation and rehabilitation. Structures from different periods of history are analyzed.	MECHANICS OF HISTORICAL MASONRY STRUCTURES
78494	In the course, element for modelling of offshore structures will be given. Three main parts of the course will be: equivalent static and dynamic modelling of the actions, including wave action and wind, both in the time and frequency domains; finite element modelling of the structure, stress and displacement recovery and verifications; modelling and verifications against cyclic loadings, with special emphasis to fatigue and damage of metallic materials.	MODELLING OF OFFSHORE STRUCTURES
78640	This course provides theoretical and operative knowledges concerning the monitoring and positioning aspects in the offshore engineering. In particular, different techniques for an accurate positioning based on GNSS technology will be introduced both for monitoring of off-shore structures and for geolocalization of off-shore infrastructures. Examples of real applications regarding the monitoring or the positioning of offshore structures will be discussed.	MONITORING AND POSITIONING IN OFFSHORE ENGINEERING
72764	A successful learner from this course will be able to: a) deal with numerical analysis topics such as: accuracy, truncation and round-off errors, condition numbers, convergence, stability, curve-fitting, interpolation, numerical differentiation and integration, numerical linear algebra; b) deal with numerical methods for solving ordinary and partial differential equations, with finite difference and finite element methods for parabolic and elliptic partial differential equations, applications of computer programs to case studies derived from civil engineering practice.	NUMERICAL METHODS
78639	The course aims to provide tools and skills for the design and management of ocean structures, as well as the assessment of their impact. The course will introduce and describe the processes that characterize the oceanic environment and will provide tools for the analysis and design offshore structures and offshore approach facilities, and renewal energy plants. In particular the student will be able to analyze the sea conditions (waves, currents) and to design ocean structures, as offshore structures (TLP, spar buoys) and their interaction with waves. Attention will be dedicated to oil spill dispersion from offshore structures. The conversion of energy from the sea (waves and currents) will also be treated.	OCEAN ENGINEERING

Code	Aims and objectives	Course (alph. order)
78486	The aim of the course is to provide specific knowledge on the Health, Environmental and Safety issues in off-shore operations, also focusing on those related to the production of Oil&Gas resources.	OFFSHORE HSE MANAGEMENT
79031	The learning outcome of this course is to provide the fundamental knowledge for the exploitation of hydrocarbon oil and gas off-shore reservoirs. In particular, geological, geophysical, drilling and production activities for a rational exploitation will be given.	OFFSHORE O&G RESOURCES EXPLOITATION
81511	The student will be introduced to the management of projects in the specific framework of the off-shore industry, with the aim of understanding the activities required to effectively manage a large-scale off-shore project.	PROJECT MANAGEMENT IN OFFSHORE ACTIVITIES
78965	The aim of the course is to give a complete survey of the juridical and judicial landscape of the Italian and European systems in the topic of public procurement and contract.	PUBLIC PROCUREMENT
78595	<p>The objectives of the unit are to gain a clear understanding of: □ why road safety is important, how we can achieve improvements and who is doing the work; □ the multidisciplinary nature of road safety and why we need to use a combination of engineering, education and enforcement to be successful; □ the behaviour of road users and ways in which the road environment can be designed/improved to cater for their needs; □ the complexity of the human/vehicle/road system and how the interrelationships work to influence the level of safety; □ what are the legal responsibilities of road authorities and decision makers and how they can fulfil them; □ how to undertake accident investigations; □ how to collect accident data and what to look for in quality data; □ how to analyse accident data, turn it into information and develop cost effective, practical counter measures; □ what needs to be done after treating a site and how to do it; □ how to be proactive in preventing accidents before they occur.</p> <p>Specific skill sets developed in the class are: - Analysis of traffic collision and injury data; - Analysis of collision risk in a road network (network screening); - Identifying crash causal factors; - Identifying and evaluating countermeasures; - Principles of Road Safety Management. - What is the Road safety Audit procedure, and what are aims and objectives, roles and responsibility; history of road safety audit, road safety audit and design standards, road safety audit tasks, various stages of safety audits; common identifiable problems. - How to structure a road safety audit report, identify common problems. - Case studies and site visit; what to look for on site visits.</p>	ROAD SAFETY ENGINEERING

Code	Aims and objectives	Course (alph. order)
72807	Knowledge of properties, application and manufacturing technology of main composite materials. Comprehension of the mechanisms which allow to obtain particular properties on the basis of material components and their architecture. Ability in the choice of the most suitable composite material on the basis of the technological requirements of the product.	SCIENCE AND TECHNOLOGY OF COMPOSITE MATERIALS M
72785	The method for safety evaluation and risk assessment of civil structures will be studied. Definition of loadings and structural safety will be given in a probabilistic framework. Risk assessment of civil structures in earthquake regions will be analyzed with details.	STRUCTURAL SAFETY
72789	In the course, the student will know the techniques for the strengthening and rehabilitation of civil structures (buildings and infrastructures), made of reinforced concrete, steel or masonry. The techniques for strengthening in seismic areas will be also studied.	STRUCTURAL STRENGTHENING & REHABILITATION
72748	Course overview, introduction to sustainability. Definitions, trends, measurements. Aspects on sustainability (environmental, economic, social). Environmental footprint of engineered systems, with emphasis on civil engineering (energy consumptions, CO2 emissions, etc). Performance-based design and life-cycle planning. The various aspects to be considered for sustainability in construction: material's production and transformation, management of construction process, occupancy (use costs energy and cost consumptions), occupancy (maintenance and durability issues), end-of-life costs, reuse/recycling. Life-cycle analysis (LCA): Cradle-to-grave analysis, LCA as a min-max problem. Mathematical tools required (Optimization techniques, multi-criteria decision making methods, simulation methods, statistics). Social Life Cycle Assessment (S-LCA) and Ecologically based LCA (Eco-LCA). Safety as a prerequisite. Energy efficiency in buildings. Renewable energy with emphasis to building applications (solar thermal and photovoltaic energy, geothermal energy). Protocols for rating systems for the design, construction and operation of high performance green buildings (LEED system, Ithaca).	SUSTAINABILITY IN CONSTRUCTION
78737	The Training Objectives of the SUSTAINABLE BUILDING DESIGN course is to deliver knowledge for future construction managers and designers on the: optimization of site potential; optimization of energy use; optimize building spaces and material use. The course attenders will achieve design capabilities and skills within a total project context in order to achieve quality, high-energy performance up to nearly zero energy buildings (nZEBs).	SUSTAINABLE BUILDING DESIGN

Code	Aims and objectives	Course (alph. order)
78596	<p>Students of this course will learn advanced methods for the design of water resources systems. The main focus will be (1) the estimation of water resources in the presence of human impact and climate change, (2) the estimation of water demands, and (3) the evaluation of alternative solutions for reconciling the availability of water resources with the increasing water needs and the preservation of ecosystems and the environment. Decision theory will be considered as an effective and transparent means to evaluate competitive solutions, while uncertainty assessment will provide the basis for a pragmatic design. The joint analysis and modeling of water resources systems and societal systems will be the driving concept of the course.</p>	<p>SUSTAINABLE DESIGN OF WATER RESOURCES SYSTEMS</p>
81509	<p>A successful student will know how roads are designed and built as well as learn about the construction materials and technologies either traditional and innovative. The approaches to evaluate the interaction and management of storm and ground waters through the infrastructure are taught.</p>	<p>SUSTAINABLE ROAD INFRASTRUCTURES</p>
78493	<p>The course is aimed at providing basic principles for design and operation of typical fluid machines used for land application in off-shore installations.</p>	<p>TURBOMACHINES AND POWER GENERATION FOR OFF-SHORE APPLICATIONS</p>