



Une nouvelle génération d'université

MSc Degrees University of La Rochelle

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Master of Science in Information Technology: Corporate Computer Engineering

Course structure

Course structure : 2 years full time

Course outline :

The ICONE Master's degree of Science is supported by our Computer Science laboratory which provides state-of-the-art digital facilities and software development tools. Our course programmes have been put together with our many successful business collaborations, enabling our taught courses to be informed by industry and thus facilitating Research.

Objectives:

The MSc in Information Technology aims at imparting to students a comprehensive knowledge of digital workflow management in private companies and public organisations.

In the first year, students are given an overall knowledge of digital workflows, covering digitalisation, digital content Management and Broadcasting.

In the second year, students opt for one of the following three programmes: ISI, IID or IND.

1. ISI - Ingénierie des Systèmes d'Information - Information System Management

Objectives:

- Developing solid awareness and understanding of a company operational aspects
- Analysing company needs in order to define the hardware and software architecture that will best meet the company or organisation requirements.

2. IID – Ingénierie de l'Information et de la Décision - Business and Management

Objectives:

- Exploring the many ways in which Information Technology supports and enables business and management activity processes
- Training students to analyse existing data within a company's information system, extracting relevant indicators in order to assist companies in their development.

**3. IND – Ingénierie de la Numérisation et de la Dématérialisation –
Digitalisation and Dematerialisation Engineering**

Objectives:

- Enabling students to understand the needs of a company willing to digitalise corporate memory,
- Implementing dematerialisation processes,
- Interpreting, indexing and providing access to digitalised records, in order to feed the information system.

Course Modules

Year 1 – 1st semester

Modules	ECTS (Credits)
<p>Business Process Modeling Business analysis consisting in process representation to identify process efficiency and quality improvements.</p>	1
<p>Business Corporate Communication – Human Resources Communication for strategic Management</p>	1
<p>Account Management Operation Analysis, Data processing, Mathematics, Statistics, Economics</p>	2
<p>English</p>	2
<p>Programming Techniques Computer Programming Style, computer programme structure building</p>	6
<p>Software Engineering Software design, development and maintenance</p>	6
<p>Advanced Database Techniques <u>Key definitions and notions:</u> files and structures, conceptual, physical and external schemas, relational database models, network, hierarchical and entity-relationship models.</p>	6
<p>Computer System Administration Maintenance, configuration and reliable operation of computer systems, especially multi-user computers, i.e. servers.</p>	6

Year 1 – 2nd semester

Modules	ECTS (Credits)
<p>Industrial and Intellectual Property Rights Copyright, trademarks, patents, industrial design rights, trade dress.</p>	1
<p>Introduction to Project Management Planning, organising, motivating and controlling resources to achieve specific goals</p>	1
<p>Decision-making Strategy and Business Plan</p>	2
<p>English</p>	2
<p>Information System and Decision Support System Hardware and software networks study</p>	5
<p>Digitalisation Object, image, sound, document or signal representation</p>	5
<p>Digital Content Broadcasting Practice at using digital data rather than analogue waveforms to carry broadcasts over television channels or assigned radio frequency bands.</p>	5
<p>Networks, Security and Storage Taking a look at Security issues related to data travelling over the network. Understanding why organisations need to become more security-aware when dealing with storage strategies.</p>	5
<p>Internship in Industry or Research laboratory</p>	4

Year 2 – 1st semester

Modules	ECTS (Credits)
Quality and Sustainable Development	1
Company Functional and Value Analysis	1
Good Practice in Project Management -ISO21500	2
English	2

AND

1 of the 3 following options:

OPTION 1 – ISI – Information System Management

Modules	ECTS (Credits)
Software and Services Architecture Software design and software architecture design pattern based on discrete pieces of software providing application functionality as services to other applications.	6
Information and System Infrastructure Processes, procedures, tools, facilities and technology supporting Information creation, use, transport, storage and destruction.	6
Research Methodology Systematic, theoretical analysis of methods applied to a defined field of study	2
Research Applications Tackling Research issues by means of new methodologies	2
Industrial Applications Solving practical problems resorting to empirical methods	4
New Technologies and Organisations Latest knowledge about current new tools, machines, techniques and systems	4

OPTION 2 – Business and Management

Modules	ECTS (Credits)
Mobility and Information Research Exploring innovative technologies and services likely to improve information research in mobility models	6
Data Mining Computational process for discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics and database systems.	6
Research Methodology Systematic, theoretical analysis of methods applied to a defined field of study	2
Research Applications	2

Tackling Research issues by means of new methodologies	
Industrial Applications Solving practical problems resorting to empirical methods	4
New Technologies and Organisations Latest knowledge about current new tools, machines, techniques and systems	4

OPTION 3 – Digitalisation and Dematerialisation Engineering

Modules	ECTS (Credits)
Dematerialisation Processes Studying the dematerialisation process techniques, advantages and drawbacks.	6
Semantic Content Management Defining, finding, understanding, using and exchanging data by managing standards and metadata as organisational assets.	6
Research Methodology Systematic, theoretical analysis of methods applied to a defined field of study	2
Research Applications Tackling Research issues by means of new methodologies	2
Industrial Applications Solving practical problems resorting to empirical methods	4
New Technologies and Organisations Latest knowledge about current new tools, machines, techniques and systems	4

Year 2 – 2nd semester

Modules	ECTS (Credits)
Internship in Research Laboratory or in Industry	30

Master of Science in Biotechnology

Two programmes:

Biochemistry

Biotechnology and Management in Agri-food Industry

Course structure

Course structure : 2 years full time

Course outline :

The Master's degree of Science in Biotechnology is supported by our LIENSs Laboratory (**Littoral, Environnement et Sociétés**), a centre of Excellence in Environmental Research. It brings together six Research Units which pool their expertise in multi-disciplinary research.

This Master's degree in Biotechnology provides in-depth knowledge and skills necessary either to a career in Research or in Agrifood industry, according to the programme chosen :

Msc in Biotechnology – BIOCHEMISTRY

This programme prepares students for a career in Research in Biochemistry, giving them thorough knowledge in the many diverse applications of biochemistry such as pharmacology, genetics, immunology or bio-informatics as well as perfecting their skills in laboratory science.

The MSc in Biochemistry is supported by our LIENSs laboratory. At the cutting edge of research, it is a CNRS government-funded centre of excellence (Centre National de Recherche Scientifique).

Teaching is research-led and our staff are involved in numerous interdisciplinary subjects including coastline Environment, Green Chemistry Development or research in the increasingly obvious links between metabolic diseases and cancers with compounds or risk situations present in our Environment.

Our teams of researchers teach with a focus on the latest research findings, techniques and cutting-edge practices, in the realms of enzymology, chemistry and cellular biochemistry.

Related application fields are : fine chemistry, human and animal health, pharmaceutical industry, environment, animal production, nutrition, agri-food industry, cosmetic industry, bioenergy.

Our students are taught how new applications have continued to evolve in this exciting field of study.

Msc in Biotechnology – BIOTECHNOLOGY AND MANAGEMENT IN AGRIFOOD INDUSTRY

This programme is designed for students who want to develop a career in the agri-food industry.

This 2-year graduate course will give students knowledge in Innovation, Management, Distribution and Quality Management as well as in laboratory science. Our goal is to increase our students' communication skills in French and two foreign languages, to provide them with sound knowledge in Project Management in order to be competitive in today's corporate world, while training highly skilled industrial managers specifically for the food industry.

Half of all lectures and seminars are therefore given by guest lecturers from the Agri-food industry. We have developed successful business collaborations which enables us to invite top-quality professional lecturers to our seminars.

As part of their course, students opting for the Food Industry programme will have the opportunity to take part in the whole process of brewing beer in the university's own brewery "Science Infuse" (10hl capacity), from yeast propagation to marketing the product as well as bottling and capping.

Course Objectives :

- Developing engineering skills and gaining specialist knowledge

- Mastering laboratory science skills and techniques
- Being able to work in a team
- Being able to communicate in two foreign languages

Course Modules

Biochemistry: Year 1 – 1st semester

Modules	ECTS (Credits)
Bio-organic chemistry Mechanisms, chimio-selectivity; asymmetrical & biological synthesis; natural products; dualfunctional compounds)	6
Genic Expression Detailed regulation of eukaryotic promoters, biotechnology tools, genic expression pathways and controls, transgenesis.	6
Functional Properties of Macromolecules Structure/function relation with functional properties (gelling, emulsifying..), role of hydrolysis	2
Immunology Advanced Immunology. Analysis of Research articles about Human Immunology and strategies in immunotherapies	4
Spectral Analysis (MS, MS/MS RMN..)	2
Microbiology Bioactive metabolites, antimicrobial agents, biological cycles, biological risks	4
Business Process Modeling	1
Corporate communication and Human Resources	1
Company Management	2
English	2

Biochemistry: Year 1 – 2nd semester

Modules	ECTS (Credits)
Applied Enzymology Non conventional enzymology, active site enzyme topology, immobilisation bioreactors, heterogenous media.	4
Agroresources development Polysaccharide, depolymerisation	2
Medicinal Chemistry	3
Research and Innovation Project	1
Design of Experiments (DOE)	2
Exploratory Agri-Food Data Analysis	4
Molecular Virology General principles, virus characterisation, vaccines & therapies, viral families	4
Molecular Pharmacology Advanced molecular and cellular pharmacology - Analysis of Research articles	2

about molecular pharmacology.	
Introduction to Project Management	1
Strategy and Business Plan	2
English	2
Industrial Property Rights	1
Internship in Research Laboratory or in Industry	2

Biochemistry: Year 2 – 1st semester

Modules	ECTS (Credits)
Proteome, Peptidome and Cryptome From "OMICS" to animal (proteomics, new medicines and biomarkers, cryptides, in vivo and in vitro experiments, ethics).	3
Cell Communication and Adaptation Sensing and adaptation to molecular oxygen in eukaryotic and prokaryotic cells, physiological adaptations in bacteria (quorum sensing, virulence, motility)	3
Genomics Functional genome analysis, sequences and computer assisted sequencing	3
Bioremediation Fundamentals in water analysis, molysmology, toxicology and ecotoxicology	3
Chemistry for Sustainable Development	3
Nanobiotechnology Introduction to nano-objects, biomimetic structures and optical tools	3
Scientific Argumentation Linguistic analysis focused on current debates about biotechnologies (Rethorics, Argumentation, Pragmatics, Ethics)	2
Research Management Intellectual Property, Research Fund Raising	2
Seminars and conferences Topics selected from latest Research projects or findings	2
Quality and Sustainable Development	1
English	2
Company functional Analysis	1
Good Practice in Project Management	2

Biochemistry: Year 2 – 2nd semester

Modules	ECTS (Credits)
6 month-Internship in Research Laboratory or in Industry (from beginning of January to end of June)	30

Biotechnology: Year 1 – 1st semester

Modules	ECTS (Credits)
Industrial microbiology Microorganisms (monitoring, control, uses and metabolisms) and utilisation in an industrial environment	3
Microbiological processes Management	3
Unit Operations in Bioindustries Water activity, Food preservation processes & Methods, Separation processes	6
Molecular Tools Genetic engineering, genome analysis tools and applications (GMOs, gene therapy), contaminant detection in water and food, traceability, Genetic disorder diagnosis.	4
Products in the Food processing Industry Biochemical, technological, nutritional aspects and valorisation of food processing by-products (Vegetable, dairy, oil, egg and meat products)	3
Brewing - Fermentation Bringing together Biochemistry, Microbiology and Industrial Physics in order to teach students the brewing process, combining theory and hands-on practice in our university brewery (capacity :10hl)	3
English	2
Spanish or German	2
Business Process Modeling	1
Corporate communication and Human Resources	1
Company Management	2

Biotechnology: Year 1 – 2nd semester

Modules	ECTS (Credits)
Food Biochemistry Water, carbohydrates, lipids, proteins in food systems and their transformations during food processing and storage	2
Marketing	2
Research and Innovation Project	3
Innovation Management Methods	3
Design of Experiments (DOE)	2
Exploratory Agri-Food data analysis	4
Introduction to Project Management	1
Strategy and Business Plan	2

English	2
Spanish or German	2
Industrial Property - Industrial Property Rights	1
3 month-internship in Research Laboratory or in Industry, from April to June	6

Biotechnology: Year 2 – 1st semester

Modules	ECTS (Credits)
Food Hygiene and Safety	2
Nutritional Balance and Food risks	4
Safe Quality Food (SQF) Management	3
HACCP Approach (Hazard analysis Critical Control Point)	3
Food Supply Distribution Channels	2
Agri-food Case Studies Business Process Definition (BPD) project and Project Planning	2
Industrial Performance Management	2
Global vision of Agri-food sectors	3
English	2
Spanish or German	3
Quality and Sustainable Development	1
Company Functional and Value Analysis	1
Good Practice in Project Management -ISO21500	2

Biotechnology: Year 2 – 2nd semester

Modules	ECTS (Credits)
Corporate Policy	2
6 month-Internship in Research Laboratory or Industry (from beginning of January to end of June)	28

Master of Science in Material Science and Engineering: Corrosion, Degradation and Protection of Materials

2 programmes:

Durability and Protection of Metallic Materials (DPM)

Durability and Ageing of Polymers and Composites (VPC)

Course structure

Course structure : two years full-time

Course outline :

The Master's degree in Material Science and Engineering gives students a solid background in material durability and structure. Students acquire knowledge in the specific field of the prevention and protection of materials exposed to aggressive media or exposed to ageing.

Two coursework projects :

Year 1 : Literature Searching on an industrial topic

Year 2 : Case study about material degradation or fracture

Course objectives :

- Understanding the degradation mechanism of materials exposed to aggressive media
- Investigating the inspection techniques used for the diagnosis and control of materials
- Analysing and putting forward remedies and solutions to ensure industrial facilities and structure sustainability.

Course Modules

Year 1 – 1st semester

Modules	ECTS (Credits)
Numerical methods & Materials	3
Finite Elements Introduction of finite elements through applications using SolidWorks and comsol multiphysics	3
Metallurgy (solidification and diffusion)	5
Thermodynamic of solid solution Alloys Binary diagrams, crystallographic approach	2
Mechanical Properties of Materials	6

(elasticity, plasticity)	
Polymers and Composites Classification of polymers and elaboration of composites	5
English	2
Business Process Modeling	1
Corporate communication and Human Resources	1
Company Management	2

Year 1 – 2nd semester

	Modules	ECTS (Credits)
	Electrochemistry (kinetics) Fundamentals in electrochemistry, oxydo-reduction, electrochemical double layer, charge diffusion and batteries	3
	Thermodynamics of ionic solutions (ionic strength, reference electrode, potential)	2
	Corrosion 1 Mechanism of humid and dry corrosion	2
	Bibliography Assignment Literature Searching on an industrial project about new process or material development	2
DPM	Protection of Materials Material choice and protection methods commonly used in Industry	4
	Material Durability & Environment Degradation impact on the Environment and environmental influence upon material durability	5
VPC	Polymers Elaboration and Characterisation	4
	Mechanical Properties of Polymers & Composites Viscoelastic properties and plasticity	4
	Introduction to Project Management	1
	Strategy and Business Plan	2
	English	2
	Industrial Property Rights	1
	2 month- internship in Research Laboratory or in Industry,	4

Year 2 – 1st semester

	Modules	ECTS (Credits)
	Numerical Methods in Material Sciences Project on material characterisation using thermodynamical approach and model	3
	Organic coatings	2
	Interface and Adhesion (adhesion, interface and surface energy)	2

	Inspection & Control project Industrial-related topic about degradation or fracture analysis	2
DPM	Corrosion 2 Localised corrosion mechanism, tribocorrosion, passivity and corrosion stress cracking	5
	Industrial Inspection Industrial application of corrosion in different sectors	1
	Protection of material 2 High temperature application	2
	Recycling and Recovery Life cycle analyses of material durability - Environmental regulations	3
	NDT, fractography and Environment Introduction to non-destructive techniques in the corrosion field of metallic materials. Fracture analyses : ductile and brittle	4
VPC	Polymer Ageing - Chemical and physical polymer ageing	3
	Physical Chemistry of Polymers Copolymers and elastomer properties	2
	Composites Structure mechanical characterisation and design	3
	Non destructive Techniques Material characterisation: ultra sonic, Dye penetration inspection, electromagnetic inspection, thermographic inspection	4
	Durability of Polymers : inspection techniques	3
	Quality and Sustainable Development	1
	Company Functional and Value Analysis	1
	Good Practice in Project Management -ISO21500	2
	English	2

Year 2 – 2nd semester

Modules	ECTS (Credits)
6 month-Internship in Research Laboratory or in Industry	30

Master of Science in Environmental Science

3 programmes:

Ecology

Geoscience

Geography

Course structure

Course structure : 2 years full-time

Course outline :

The Master of Science in Environmental Science is designed to train students to become fully qualified environmental scientists by giving them comprehensive knowledge in several fields, thus developing a global approach to environmental issues.

This MSc is characterised by a multidisciplinary approach embracing :

- **Life Sciences** (Population Biology, Understanding Ecosystems)
- **Earth Sciences** (Geosciences),
- **Humanities** (Environment & Society interaction, Public policies for managing and protecting open space, landscape dynamics and history, Environmental Law & Management)

Environmental Science is a multidisciplinary academic field which has undergone tremendous expansion in recent years, with a blurring of clear-cut boundaries between disciplines.

Nearly unique in France, La Rochelle's Master's degree enables students to broaden their knowledge in environmental issues and typically takes a contemporary approach. This MSc offers a combination of modules across the spectrum of different disciplines, yet with opportunities to specialise in particular areas.

The MSc in Environmental Science brings together three faculties of the University of La Rochelle to create a talented aggregation of academics in a variety of specialities, working together on the same Research projects.

This degree course plays a leading and federating part in Research themes identified as strategic for the University of La Rochelle, e.g. **Coastline Management, Environmental Hazards and Risks, Urban areas, Sustainable Development.**

The MSc in Environmental Science is supported by our LIENSs laboratory (Littoral, Environnement Sociétés). At the cutting edge of Environmental Research, it is a "CNRS" government-funded centre of excellence (Centre National de Recherche Scientifique). **The LIENSs laboratory was one of the first French laboratories to federate transdisciplinary research in Coastline Environment.**

We have developed **many successful collaborations** with the local council environmental organisations for environmental and community projects, also with planning and environmental design consultants, as well as with national Government offices in charge of coastline protection and management.

Locally, our estuarine and coastal ecosystems on the Atlantic coast make up very productive mudflats, used for shellfish aquaculture. Anthropisation of our shorelines has been increased by tourism, threatening the Environment.

Estuarine and coastal marine Management and protection, including risk assessment, have become key elements in our study of coastline sustainable development.

Our course programmes include new rules and regulations regarding Marine Biodiversity Conservation in a view to future implementation of protected areas.

Our programmes also delve into a wide range of environmental issues which involve an interaction of physical, chemical and biological processes and have become strategic in many areas such as Environmental Health, Energy supply, Water supply or Agriculture.

Last but not least, La Rochelle's geographical location, right on the Atlantic coast, is ideally suited for student field work.

Course Modules

Year 1 – 1st semester

Common Modules to the three programmes:

Modules	ECTS (Credits)
<p>Methodology for scientific writing and oral presentations How to read and review a scientific journal article. 20h practicals : Document search (Scoopus, Google Scholar, science Direct, PubMed), scientific publication focused reading, assessment, summaries.and critical reviews; reference quotes, bibliographies. Oral presentation practice</p>	2
<p>Environment I : Integrated Coastal Zone Management This module provides students with relevant information for the analysis and elaboration of their own career project. They are given a critical perspective on theoretical models and on environmental policies implementation.</p>	2
<p>English</p>	2

ECOLOGY Programme:

Modules	ECTS (Credits)
Data Analysis	4
Ecophysiology	4
Adaptation and Conservation	4
Coastal Environment Dynamics	3
<p>Physical Geography applied to coastal areas This module integrates human and physical geography into a holistic view of human-environment relations. Complex interactions among the physical and human aspects (land planning, land policies) are explored in relation to issues such as coastal risks (from submersion to erosion) - surveying, data collecting and analysis ; study of natural disasters</p>	3
<p>Corporate Sustainable Development Course objectives: enabling students to understand Sustainable Development and Corporate social Responsibility; examining Quality, Health&Safety and environmental impacts.</p>	3
*Introduction to Coastal Hazards and Risks	3
*Introduction to Physical and Chemical Oceanography	3
*Fundamentals in Marine Ecology	3
*Corporate Management : Strategy, Organisation and Human Resources	3
*Into the Business World: Management Simulation Exercises	3

* For MSc 1st year validation : students are required to choose 1 out of the 5 modules above.

GEOSCIENCE Programme:

Modules	ECTS (Credits)
Data Analysis	4
Variation of Sea Level	3
Hydrodynamics and Sediment Processes	5
Ecology Principles for non-specialists	3
Physical Geography applied to Coastal Areas	3
Corporate Sustainable Development	3
Corporate Management : Strategy, Organisation and Human Resources	3

GEOGRAPHY Programme:

Modules	ECTS (Credits)
Tourism and Sustainable Development	2
Tourism and Protected Marine Areas	2
Morphodynamic Processes and Evolution of Coastal Environments	2
Coastal Geomorphology	2
Tools for Geography : GIS and Databases	2
Coastal Overdevelopment & Urban Sprawl : Actors and issues	2
Principles of ecology for non-specialists	3
Coastal Environment dynamics	3
Corporate Sustainable Development	3
Introduction to Coastal Hazards and Risks	3
Introduction to Physical and Chemical Oceanography	3
Corporate Management : Strategy, Organisation and Human Resources	3
The Business World: Management Simulation Exercises	3

Year 1 – 2nd semester

Common Modules to the three programmes:

Modules	ECTS (credits)
English	2
Environment II: Case Studies	2
Coastal and Environment Law Environment Law, Coastal zone Law, Maritime Public Domain, Urban planning Law	2
Internship in Research Laboratory or in Industry	3

ECOLOGY Programme:

Modules	ECTS (Credits)
Landscape Ecology	2
Water Quality, Ecotoxicology, Bioremediation Fundamentals in water analysis, molysmology, toxicology and ecotoxicology to develop awareness of marine ecosystem contamination issues. The main objective is to develop skills in risk assessment.	5
Coastal and Estuarine Ecology 1. The rocky shore malacofauna communities, 2. The invertebrate assemblage from subtidal sediment, 3. The <i>Osilinus lineatus</i> population structure. Students get involved in the whole process of the ecological study: sampling, sample treatment, data collection, statistical analysis, graphical summaries, biotic index calculation and summary report writing. (27 hours teaching+30 hours individual study time) Entry requirements : Marine biology and ecology, Statistical tools (univariate and multivariate analysis), biotic index tools (AMBI, M-AMBI...)	2
Coastal Ecology and Oceanography	3
Microbial Ecology and Trophic Web	3
Management plan implementation : Actors and Stakeholders	3
Introduction to GIS and Cartomatics	3

GEOSCIENCE Programme:

Modules	ECTS (Credits)
GPS observation applied to Geodynamics	3
Hydrogeology	3
Sediment Characterisation	3
Coastal Environment Evolution	6
Management Plan Implementation : Actors and Stakeholders	3
Introduction to GIS and Cartomatics	3

GEOGRAPHY Programme:

Modules	ECTS (Credits)
GIS, Databases and Teledetection	4
Cartomatics	2
Geography Applied Statistics and Surveying Techniques	2
Coastal Management Principles	3
Human Settlements and Urbanisation of Coastal and Island Areas	2
Introduction to Conservation Biology	3
Fundamentals in Statistics	3

Year 2 – 1st semester

Common Modules to the three programmes:

Modules	ECTS (Credits)
Sustainable Development Policy	2
Environment III: Environmental and Societal Issues linked to global changes	2
Quality Processes and Main Action programmes for Quality, Safety & Environmental Policies	2
<p>English</p> <p>A certification of language skills will be provided with the Master's degree, according to the European Council's framework for language skills assessment, used by most Higher Education Institutions in Europe</p>	2

GEOGRAPHY APPLIED TO COASTAL ENVIRONMENT MANAGEMENT

Modules	ECTS (Credits)
Geomatics and Geostatistics	3
Project Management	3
Coastal Urban Environment : actors and issues	3
Local Management : Diagnosis : Strategy and Policy	3
Coastal Tourism Development Management	3
Environmental Status Assessment	3
Coastal Geomorphology II	3
Morphodynamic processes and Evolution of Coastal Environments II	3

ANTHROPISED ECOSYSTEM MANAGEMENT

Modules	ECTS (Credits)
Social and Economic Aspects of Environment Management	6
Environmental Project Management	2
Numerical Analysis	2
<p>Fundamentals in Geographic Information Systems (GIS) Fundamentals in Geographic Information Science Introduction to GIS, Spatial Data Analysis and Cartography - Surveying, Mapping, Data analysis methods such as Geoprocessing, Map Overlay. Hands-on practice with ArcGIS 10,2 or alternative open source GIS (QGIS)</p>	2
* Integrated Management of Wet Areas	5
<p>* Subtidal Ecosystem Biology and Ecology Unique in its kind, La Rochelle's MSc offers students underwater Biology practicals: Underwater environments such as the benthic subtidal rocky shore and sediment coastal ecosystems being explored and studied by scuba-diving.</p>	5
Biodiversity Management	4
<p>Water Resources Management Synthetic knowledge on water quality management, water availability, with reference to human health risks and ecological status. Hydrogeology, biological treatment processes, lagoon treatment systems,</p>	3

Eutrophication and restoration ; French monitoring networks for water quality with focus on toxic algae, The European Water Framework Directive (WFD), the European Marine Strategy framework Directive (MSFD) and the European "Good Environmental Status" criteria.
 Management of water resources (surface waters and aquifers) : Water resources as drinking water, recreational water or irrigation water. Water use related conflicts. Impacts on aquatic environment.
 Planned Coursework on eutrophication and remediation processes.

* For MSc 2nd year validation : students are required to choose **one** out of the two modules above.

ECOLOGY AND DYNAMICS OF COASTAL AREAS AND ESTUARIES

Modules	ECTS (Credits)
Career Project -Coursework Preparation	6
Ecosystem Numerical Modelling. Objectives : developing skills in Ecosystem modelling (individual growth, ecophysiology, primary production, population dynamics, predator/prey interactions), model parametrisation, sensitivity analyses, numerical runs ; practice on Matlab.	2
Numerical Analysis Biology and geophysics numerical analysis methods: multivariate analysis,time series, interpolation techniques, multi-source data quality assessment, ecology, R language and other softwares used in biogeoscience.	2
Coastal Area Geographical Information Systems (GIS)	2
Coastal Area issues in Ecology	6
Coastal Area issues in Geoscience	6
Field Sampling The aim of this course is to acquire information from field observation in coastal ecosystems. By the end of the course, students will have acquired basics about sampling strategies and sampling gears in coastal ecosystems and will have developed the following skills : sample collection, preservation and treatment, identification of sediment grain size, taxonomy of macrofauna from soft bottom substrate, data management, scientific report writing. Two field excursions are organised in order to answer two scientific questions. Tasks such as data management and interpretation, report writing will be performed independently by each student. Scientific questions will focus on local coastal ecosystems	6
Extreme Sea Levels and Risks	6

Year 2 – 2nd semester

All 3 programmes:

Modules	ECTS (Credits)
Internship in Research laboratory or in Industry	30

Master of Science in Building Engineering

2 programmes

New Rehabilitation and Building Techniques (TNCR)

Renewable Energy & Energy Efficiency : Management and Integration (GI3ER)

Course structure

Course Structure : 2 years full time

Objectives:

Training graduates in the field of Civil Engineering with a strong specialisation in Building Engineering whether in building structures or in Technical Equipment and energy. Students will be able to design and supervise all stages involved in construction including those relating to the preparation and monitoring of construction projects, works management, structure design, HVAC system design, energy management and renewable energy.

Course outline:

By the end of each programme of this MSc in Building Engineering, students will have learnt specialist skills in Building and Civil Engineering. Firstly, scientific and technical lessons provide students a solid academic background, giving them general knowledge and competence in civil engineering while specialising in Building Engineering, i.e. Building Structures Building and Energy.Building.

Secondly, our teaching offers students a comprehensive knowledge of professional skills. 35% of all lectures and seminars are given by guest lecturers, professional engineers we have developed close collaboration with, thus keeping up-to-date with the latest advance within the Civil Engineering sector.

Transdisciplinary teaching in Humanities, IT, Management, has complimented our MSc in Building Engineering , giving students additional skills and knowledge compared with a traditional MSs in Civil Engineering. These additional skills will have to be accounted for in their coursework about their personal career project, i.e. modern languages, Management, Accounts Management, Project Management.

Here are some examples of both scientific and cross-curricular skills that students will gain:

- Fundamentals in Engineering
- Mathematical tools for the engineer
- Engineering tools (Computer Aided Design, Metrology, Materials and Rheology)
- General skills (languages, communication, Information Technology, Multimedia)
- Building and civil Engineering (structure calculations, technical equipment and HVAC size calculations, regulatory calculation)
- Structure design, Pipe work, renewable energy integration and management
- Design and simulation of building management systems
- Computer code use, dynamic simulation
- Job interview practice, Project Management, Corporate Accounts
- Latest communication skills and techniques
- Adapting to the working environment and developing student curiosity.

Course Modules

Year 1 – 1st semester

	Modules	ECTS (Credits)
	English	2
	Business Process Modeling	1
	Corporate communication and Human Resources	1
	Company Management	2
TNCR	Theory of Structures and Paraseismic Calculations	6
	Reinforced Concrete Structure Dimensioning	6
	Framework Dimensioning	3
	Actions on Building Structure & Design	3
GI3ER	Climate Engineering Installation Design and Dimensioning	6
	Ventilation and Airflow	6
	Installation Operations & Management	6

Year 1 – 2nd semester

Modules	ECTS (Credits)
Introduction to Project Management	1
Strategy and Business Plan	2
English	2
Industrial Property Industrial Property Rights	1
Construction and Equipment Dimensioning	6
Construction Processes and on-site Management	6
Identification of Sustainable development Processes	6
8 to 10 weeks internship in Research Laboratory or in Industry,	6

Year 2 – 1st semester

Common modules to the two programmes:

Modules	ECTS (Credits)
Quality and Sustainable Development	1
Company Functional and Value Analysis	1
Good Practice in Project Management -ISO21500	2
English	

TNCR programme:

<p>Metallic and Wood Structure Advanced Calculations Design and Dimensioning of timber structures Eurocode 5 Materials, calculation, assemblies</p>	3
<p>Computer Assisted Structural Calculation and Design Structure and Charge modeling, calculation and exploitation of results, structure regular auditing</p>	1
<p>Mixed Structures Calculations Metal wood mixed structure design : definition, regulations, applications. Joint frame : introduction to Eurocode 4</p>	2
<p>Building Pathology and Risk Management Diagnosis, existing building structures, pathologies and repairs, transformation adaptation structures, project rehabilitation/pathology</p>	2
<p>Calculation of structures undergoing Rehabilitation Seismic retrofitting of existing structures</p>	2
<p>Properties of New Concrete High performance concrete : general points, properties, formulation use. Case study, Auto-setting concrete, Properties characterisation and implementation; ready-mixed concrete : standardisation, delivery, exposure classes projects</p>	2
<p>Transfer Phenomena in Porous cementitious media Homogenisation methods Extension to partially saturated porous media</p>	2
<p>Sustainability of Reinforced Concrete Buildings Structure durability - Calculating a BA sailing subjected to seismic torsor effort</p>	2
<p>Advanced Calculation for Concrete Buildings Combined bending Reinforced concrete to Eurocode 2 - sizing, verification, examples, design practice of a retaining wall, torsion reinforced concrete, reinforced concrete raft, BA bracing structures and Masonry.</p>	2
<p>Calculations or Prestressed Concrete Structures Calculation of losses in prestressed post-tensioned structure - Principles and application</p>	2
<p>Seismic design of structures Applications and examples</p>	1
<p>Design, Building Calculation and Building Works Engineering Student Project based on work in progress</p>	1

GI3ER programme:

<p>Mass and Heat Transfers Presentation of the principles of conservation of Heat and Mass. This module covers the radiation, conduction, convection concepts as well as Moisture Transfer inside a building.</p>	2
<p>Evaluation of Energy Efficiency for Housing & Buildings The objective of this module is to get used to handling modeling tools for the assessment of buildings and to be able to diagnose existing buildings (pricing and energy market).</p>	2
<p>Building Physics and Environmental Context Contextualising the environmental impact of construction choices and the energy consumption in the building sector. Students will be able to establish and quantify the relation between building conceptions and their equipments and the local and global</p>	2

environment.	
<p style="text-align: center;">Control systems in HVAC</p> <p>Getting accustomed with regulation and functional analysis. Then, searching for indicators. Design of a centralised technical management and architecture of energy systems. Live presentation of a WEB automaton server.</p>	2
<p style="text-align: center;">System Characterisation and Regulation</p> <p>The objective is to control distribution systems as well as their emissions. Standardisation of aerodynamics bases GF. Familiarisation with the Energy Performance Certificate, 2005 and 2012 thermal regulation. Hydraulic installation components (boilers).</p>	2
<p style="text-align: center;">High Efficiency System Design</p> <p>Designing appropriate ventilation and thermodynamic systems with optimum efficiency for buildings. Metrology skills are necessary to assess high efficiency systems by means of measurements.</p>	2
<p style="text-align: center;">Building Modeling</p> <p>The primary objective is to provide to students the necessary tools to model the physical heat and air flow phenomena inside buildings. Models are chosen and modeling results are interpreted.</p>	2
<p style="text-align: center;">Indoor Air Quality Environments</p> <p>Understanding the phenomena that can degrade indoor environment air quality, physical modeling phenomena transfers of pollutants (gaseous and particulate) inside buildings. Concepts of light and thermal comfort.</p>	2
<p style="text-align: center;">Building Simulation Tools</p> <p>In the Building Energy Simulation (BES) module, students will have the opportunity to develop skills in setting up a building model and its systems in a building energy modeling tool (heating, cooling...), to adapt and implement a model of innovative passive systems or renewable energy use in the BES calculation tool, choose and justify passive systems adapted to the studied building design.</p> <p>Indoor air flow computation : introduction to turbulence modeling, finite volume method. Using a commercial CFD code for the purpose of indoor airflow simulation.</p>	2
<p style="text-align: center;">Electricity, Data processing, Architecture</p> <p>Assessing equipment possibilities by analysing electrical circuit diagrams in programmed logic, designing electrical power diagram. Programmed logic control from specifications.</p>	2
<p style="text-align: center;">GTC Systems</p> <p>Comparing different systems advantages and drawbacks. Leading a diagnosis study for a "GTC" on-site.</p>	2
<p style="text-align: center;">GTB Systems</p> <p>Intervention and optimisation of a technical system using GTB tools. Differentiating the various protocols used in GTB. Making a critical analysis of the various GTB resolutions put forward by manufacturers as a result of a tender offer.</p>	2
<p style="text-align: center;">Biomass and Geothermal energy</p> <p>Understanding the energy potential of biomass and geothermal power. Use and development of low temperature resources, equipment and materials, energetic auxiliary and control systems. Preliminary design of an installation using wood or geothermal power followed by deduction exercises on energy balance.</p>	2
<p style="text-align: center;">Solar thermal System</p> <p>Designing and dimensioning of solar thermal systems for heating and domestic hot water. Principles of air conditioning and solar cooling. Analysis of existing equipment facilities</p>	2
<p style="text-align: center;">Wind and Photovoltaic Energy</p> <p>Fundamental concepts in wind power, enabling students to assess whether or not to opt for wind turbine for building and industrial applications.</p> <p>Basic theory on the conversion of solar energy into electricity - Available technologies,</p>	2

energy storage, grid-connected systems, building integration and design tools dedicated to photovoltaic energy.	
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Year 2 – 2nd semester

Modules	ECTS (Credits)
6 month-Internship in Research Laboratory or in Industry	30