IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

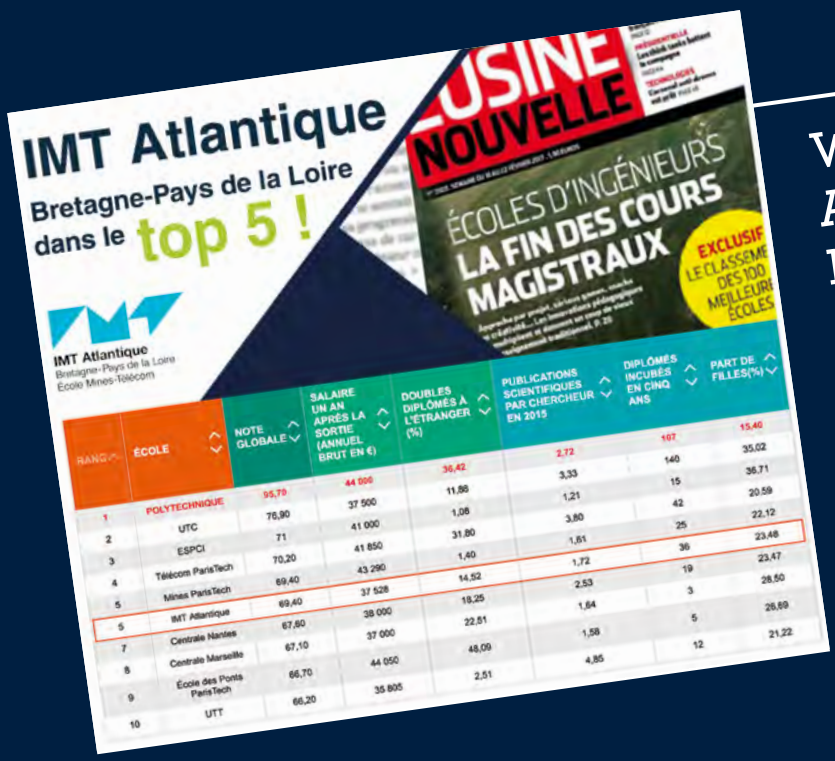
STUDY IN INTERNATIONAL MASTER'S PROGRAMS IN FRANCE

ENERGY AND ENVIRONMENTAL ENGINEERING
INDUSTRIAL ENGINEERING
NUCLEAR ENGINEERING

Nantes Campus

MSc entirely **taught in English**

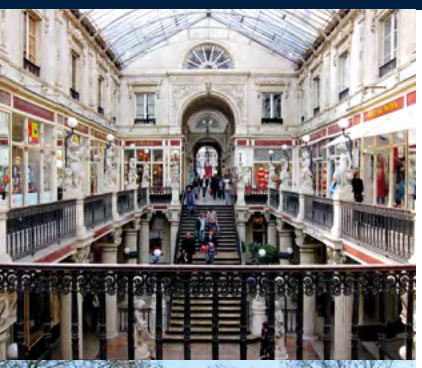
Accredited by the Ministry of Higher Education & Research

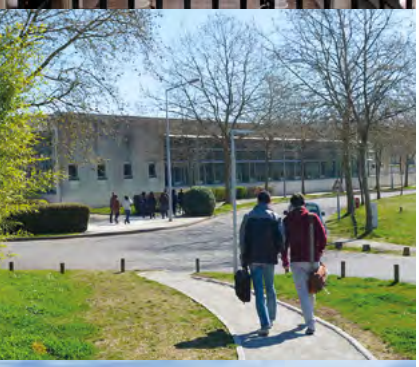


RANG	ÉCOLE	NOTE GLOBALE	SALAIRE UN AN APRÈS LA SORTIE (ANNUEL BRUT EN €)	DOUBLES DIPLÔMÉS À L'ÉTRANGER (%)	PUBLICATIONS SCIENTIFIQUES PAR CHERCHEUR EN 2015	DIPLÔMÉS INCUBÉS EN CINQ ANS	PART DE FILLES(%)
1	POLYTECHNIQUE	95,70	44 000	36,42	2,72	107	15,40
2	UTC	76,90	37 500	11,88	3,33	140	35,02
3	ESPCI	71	41 000	1,08	1,21	15	36,71
4	Télécom ParisTech	70,20	41 850	31,80	3,80	42	20,59
5	Mines ParisTech	69,40	43 290	1,40	1,61	25	22,12
5	IMT Atlantique	69,40	37 528	14,52	1,72	36	23,48
7	Centrale Nantes	67,60	38 000	19,25	2,53	19	23,47
8	Centrale Marseille	67,10	37 000	22,51	1,64	3	28,50
9	École des Ponts ParisTech	66,70	44 050	48,09	1,58	5	26,89
10	UTT	66,20	35 805	2,51	4,85	12	21,22

WELCOME TO IMT ATLANTIQUE NANTES CAMPUS !

An Elite Graduate Engineering School Among the most distinguished in FRANCE





CONTENT

MSc GENERAL INFORMATION

Course structure
2 year-full time program made of 3 academic semesters
+ 1 Master thesis (6 month paid internship in industry or laboratory).

Course language
100% English taught (except MSc in Nuclear Medical Application, 2nd year 1st semester in French)

Teaching staff
International Faculty mixing Academia and Industry experts

Intake
One intake per year in September

Degree obtained
Master's Degree

Accreditation
Ministry of Higher Education and Research
Accreditation number: ESRS1227031A

Pathway options after graduation
- Work in Industry (Project Engineers, Consultants, Development Engineer, Production Director, Manager of Research Institutions, etc)
- Continue in PhD

Website : www.imt-atlantique.fr/programs

ALSO INCLUDED INTO THE MSc

- **Internship**
- **Project Management**
- **Professional coaching**
- **Company visits**
- **Conferences/seminars related to the MSc**
- **Intercultural seminar**
- **French language and culture classes**

MSc GENERAL INFORMATION

Admission in year 1

M1

SEPTEMBER - JANUARY	1st academic semester
FEBRUARY - JULY	2nd academic semester

Admission in year 2

M2

SEPTEMBER - JANUARY	1st academic semester Possible exchange semester with partner university
FEBRUARY - JULY	Master thesis in industry or Research laboratory

Degree awarded:

Master of Science

accredited by the Ministry of Higher Education & Research

- Work in Industry
- Continue in PhD for Research

PARTICIPATION COST AND POSSIBLE SCHOLARSHIPS

Non-European students
12 000 EURO / year

Special rates for alumni from our partner universities	Participation cost per year in EURO
Alumni from partner universities*	6 500
Met at Education fairs	5 200
Excellent applications or recommended applications	4 875

Other special rates	Participation cost per year in EURO
Met at Education fairs	9 600
Excellent applications or recommended applications	6 000 / 9 000

*Please refer to our website for the list of partner universities

PARTICIPATION COST AND POSSIBLE SCHOLARSHIPS

European students**
6 000 EURO / year

Special rates for alumni from our partner universities	Participation cost per year in EURO
Alumni from partner universities*	3 000
Met at Education fairs	2 600
Excellent applications or recommended applications	2 600

Other special rates	Participation cost per year in EURO
Met at Education fairs	5 400
Excellent applications or recommended applications	4 500

*Please refer to our website for the list of partner universities
**Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Greece, Germany, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, The former Yugoslav Republic of Macedonia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden, Turkey, UK.


DEĞİRMENDERE 1
İSTANBUL

MOST

MSc in
MANAGEMENT AND OPTIMIZATION
OF SUPPLY CHAINS AND TRANSPORT

Management of production, logistics and procurement

The design, planning and optimization of global supply chains and their components (procurement, production, distribution and transport) has become a key factor of performance competitiveness for companies of all sectors in the increasingly competitive global economy. The program covers the logistics activities of companies in the productive sectors as well as in the service activities.

Courses in English

MSc MOST

MANAGEMENT AND OPTIMIZATION OF SUPPLY CHAINS AND TRANSPORT

Program coordinator
Ass. Prof. Thomas Yeung - thomas.yeung@imt-atlantique.fr

Program co-coordinator
Ass. Prof. Naly Rakoto - naly.rakoto@imt-atlantique.fr

Research Department
Industrial Engineering, Automatic Control and Computer Science

Prerequisites
To candidate in M1- First year of Master
the international Master is open to candidates with a scientific Bachelor of Science degree with any major [Industrial Engineering, Mechanical, Applied Mathematics…] or management or economics degree with strong emphasis on quantitative techniques.

To candidate in M2 - Second year of Master
the international Master is open to candidates with at least 4 years at university Bachelor or First year of master in Industrial Engineering.

- All candidates must have a certificate or other proof of English proficiency (required score: TOEFL ibt 80, IELTS 6.0, TOEIC 750, Cambridge)
- A work experience is not mandatory but is a “plus” for the selection
- No prerequisite in French

General description
The graduates of this Master of Science will be able to manage supply chains, industrial or production departments or distribution or transport systems in an international context. The program provides:

- a high level industrial engineering and management skills focused on supply chain and transport systems management
- a strong focus on quantitative methods of optimization and decision making tools for the planning of supply chain and transport systems and the ability to use them in an industrial context.
- The ability to manage projects in a complex environment and to work within an international team.
- The opportunity to apply the theoretical concept in a real industrial environment and conduct real innovative project
- The possibility to enter a high level professional career in industry or pursue towards a PhD degree

Career opportunities
- Supply chain or logistics system manager
- Project manager for supply chain development
- Consultant or expert in optimization for supply chain or transport systems
- Possibility to continue in PhD

Website : www.imt-atlantique.fr/most

Contact : most-admission@imt-atlantique.fr

Online application : https://most.imt-atlantique.fr

MSc IN MANAGEMENT AND OPTIMIZATION OF SUPPLY CHAINS AND TRANSPORT

Head of the Research Department

Prof. Alexandre DOLGUI

Distinguished Professor whose research focuses on manufacturing line design, production planning and supply chain optimization. His main results are based on the exact mathematical programming methods and their intelligent coupling with heuristics and metaheuristics algorithms. He is the coauthor of 5 books, the co-editor of 16 books or conference proceedings, the author of 192 refereed journal papers, 23 editorials and 28 book chapters as well as over 370 papers in conference proceedings. He is the Editor in Chief of the International Journal of Production Research, an Area Editor of Computers & Industrial Engineering, and an Associate Editor of Journal Européen des Systèmes Automatisés, and Member of the Editorial Boards for 23 other scientific journals. Over the last ten years, he was Member of Program Committees of over 190 International Conferences, etc. He has been responsible of the French national CNRS working group on Design of Production Systems and the regional project on Design and Management of Reconfigurable Manufacturing Systems.

Examples of Master thesis

Xhanti DONDASHE (South Africa) - **Research in Lab at Tour University**
Public transportation network design of electric buses.

Imane OUNASSAR (France) - **L'Oréal**
Supply Chain Client-Driven Cost Analysis.

Dewi PUSPASARI (Indonesia) - **Nantes Saint-Nazaire Port**
Optimization of Transport Flows in Port Nantes Saint – Nazaire.

Orianna CAMOUS (Venezuela) - **Toyota**
Establishment and standardization of KPI'S to identify best practices and areas to improve among different vehicle manufacturing plants.

Fresh Graduate's testimony, 2014-2016 batch

Oscar ALVAREZ LEAL (Mexico)

"After getting coaching sessions as part of the MOST program to prepare for the mandatory internship search, I found myself in a difficult situation: it was just hard to make the decision of which company I wanted to go, after receiving so many acceptance letters! I finally chose **Airbus**, where I worked as an intern in charge of Supply Chain Projects for 6 months."

MSc MOST

YEAR 1

MSc in Management and Optimization of Supply Chains and Transport		Year 1	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
	Fundamentals of Supply Chain Management and Optimization		
ST111PO	**Production and Operations management**	5	
	Production management and planning		
	Procurement and Inventory Management		
	Supply Chains modeling using basic tools		
ST211OR	**Operations Research 1**	6	
	Operations Research modeling and solving with software		
	Algorithmics: models development and solving in a computer language		
ST311DM	**Decision making with uncertainty and Simulation**	5	
	Probabilities and statistical decision making		
	Forecasting for supply chain demand planning		
	Simulation theory and applications to Supply Chains, production and transport systems		
	Industrial engineering management		
ST412ME	**Supply Chain performance Methods & Evaluation**		5
	Management of Quality		
	Operational efficiency		
	Supply Chains Performance evaluation		
ST512DS	**Supply Chain design & support**		5
	Product Production System and Supply Chain design and management along life cycle		
	Maintenance and reliability of product and production system		
	Selected topics		
	MANAGEMENT MODULES		
SSG11EM	**Introduction to Supply Chain Engineering and management**	6	
	Fundamentals of Supply Chain Management		
	Distribution and warehousing management and organization		
	Transport management and organization		
SSG11SP	**Strategy and project management**	5	
	Strategy of the firm		
	Project management		
	Intercultural project management		
	Communication and team work 1		
SSG12EF	**Economics, Marketing, finance and Organization**		6
	Economics, finance & accounting		
	Marketing		
	Human resources management		
	Organization of the firm and sociology of organization		
	Communication and Team Work 2		
SSG12PI	**Purchasing, e-business & Innovation**		5
	Purchasing of goods and services for supply chain management		
	E-business strategy and Supply Chain Management, concepts, methods and tools		
	Innovation management: methods & tools applied to product, and system development		
	SCIENTIFIC AND TECHNICAL PROJECT COURSES		
PRI12SC	**Operations Research 2 (Combinatorial Optim + TSP Lab)**		6
	FOREIGN LANGUAGES COURSES		
LVI11FL	**French language & Culture**	2	
LVI12FL	**French language & Culture**		2
	TRAINING FOR THE CORPORATE WORLD COURSES		
FEM11VS	**Company visits and seminars 1**	1	
FEM12VS	**Company visits and seminars 2**		1

1 ECTS credit is equivalent to 25 hours of courses and personal work

MSc MOST

YEAR 2

MSc in Management and Optimization of Supply Chains and Transport		Year 2	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
	Advanced optimization and applications in supply chains and transport		
ST121PO	**Supply chain and transport planning and optimization**	6	
	Production management and planning		
	Procurement and Inventory Management		
	Supply chain network design, facility location, reserve logistics		
	Transport planning and optimization, vehicle routing, port logistics		
	Warehouse design		
ST221PS	**Planning and scheduling of production and services**	5	
	Modeling and solving planning problems		
	Scheduling models, algorithms and applications		
	Computer simulation case studies: modeling and solving with a software		
ST321OP	**Advanced operations research**	5	
	Models and optimization algorithms		
	Modeling and solving real optimization: case studies with a solver		
	MANAGEMENT MODULES		
SSG21ST	**Supply chain information systems and technologies**	5	
	Information systems design and softwares for supply chain management		
	Decision support systems, geographical information systems (GIS)		
	Using a real ERP to model data management in a supply chain (SAP). Laboratory work		
	SCIENTIFIC AND TECHNICAL PROJECT COURSES		
PRI21SC	**Supply Chain Integrated project**	6	
	FOREIGN LANGUAGES COURSES		
LVI21FL	**French language & culture**	2	
	TRAINING FOR THE CORPORATE WORLD COURSES		
FEM21VS	**Company visits and seminars 3**	1	
FEM22MT	**Master thesis – research or industrial internship**		30
	INDIVIDUAL / SOCIETY PROJECT COURSES		
PRI12SC	**Professional coaching**	X	

PM3E

MSc in

PROJECT MANAGEMENT FOR ENVIRONMENTAL AND ENERGY ENGINEERING

Process and Bioprocess Engineering

The PM3E Master objectives are to provide skills for the management of projects from multi-sectors with a multiscale and systemic analysis of eco-technologies (environment and or energy) issues, such as water – energy nexus, waste-energy nexus, climate change adaptation to propose sustainable solution and to build green cities.

Courses in English

MSc PM3E

PROJECT MANAGEMENT FOR ENVIRONMENTAL AND ENERGY ENGINEERING

Program coordinator

Prof. Khaled Loubar - khaled.loubar@imt-atlantique.fr

Department

Energy Systems and Environment

Prerequisites

To candidate in M1- First year of Master

the international Master is open to candidates with a scientific Bachelor of Science degree with scientific background such as Chemical Engineering, Mechanical, Environmental Engineering or Energy Engineering, …

To candidate in M2 - Second year of Master

the international Master is open to candidates with 4 years at university Bachelor or First year of master in Environment (process Engineering apply to air, water, waste)

- All candidates must have a certificate or other proof of English proficiency (required score: TOEFL ibt 80, IELtS 6.5, TOEIC 750, Cambridge)
- A work experience is not mandatory but is a “plus” for the selection
- No prerequisite in French

General description

The master forms engineers capable of piloting complex projects in an international context in the environment and energy. The program provides:

- a solid scientific background and technical knowledge of processes applied to the treatment of pollution (air, water, wastes) and efficient use of energy.
- competencies in industrial process control, modeling and design
- strategies of sustainability, environmental and resource management
- a significant grounding in project management and social sciences

Career opportunities

After completion of the program, PM3E graduates find career opportunities in close connection with industry, in fields such as:

- Energy production and exploitation: Oil and gas, power generation and distribution, renewable energies
- Eco-industries: Water and air treatment, waste management and recycling, pollution reduction and remediation
- Steel and chemical production
- Building and civil sector

The main employers are major industrial groups operating worldwide as well as leading companies in France or abroad. Public or private agencies and inter-governmental organizations working for
Sustainable industrial development are also potential employers. PM3E graduates have the possibility of doing a Phd and pursuing a career in research and development.

Erasmus Mundus

PM3E is the core program for the European Joint Master in Management and Engineering of Environment and Energy (ME3), with Erasmus Mundus Label **http://web.imt-atlantique.fr/ME3**

European Commission

Website : www.imt-atlantique.fr/pm3e

Contact : pm3e-admission@imt-atlantique.fr

Online application : https://pm3e.imt-atlantique.fr

MSc IN PROJECT MANAGEMENT FOR ENVIRONMENTAL AND ENERGY ENGINEERING

Head of the Research Department

Prof. Yves ANDRES

Dr. Yves Andrès has been Professor for six years at IMT Atlantique, Bretagne-Pays de La Loire, Nantes, France. He is Head of the Energy Systems and Environment Department and leader of the "Ecotechnology" group of the GEPEA, a joint research unit of CNRS (UMR CNRS 6144), in which the IMT Atlantique is a partner as well as ONIRIS and the University of Nantes. He holds a PhD from the University of Strasbourg (1994) in Molecular Biology and Microbiology: Environmental Microbiology. His research focuses on bioprocess applied to water and air treatment as well as the fate and persistence of microorganisms in these processes. He published 100 peer reviewed research papers and supervised 30 PhD students.

This internationally renowned laboratory develops higher education, research and innovation in the field of environmental and energy engineering in order to support the Master PM3E courses.

Examples of Master thesis

Prachi Ajoy HARDIKAR (India) - **Airbus**
Impact of Aircraft Production Rates on Energy Consumption

Alexandra Doris ALVEAR CALLE (Ecuador)
National Institution of Energy Efficiency and Renewable Energies in Ecuador
Design and Planning of the Construction of a Zero Energy Building Prototype

Qipeng LIU (China) - **GEPEA Research Unit**
Opportunities of energy valorisation for the wood residues from timber industry

Andres Felipe NIETO ORTIZ (Colombia) - **TOTAL**
Benchmarking and Analysis of TOTAL S.A. Produced Water Treatment Plants

Alumni's testimony, 2011-2013 batch

Godfred Oteng BRAKATU (Ghana)

"The PM3E program creates a very healthy academic competition among the students as each one feels like a representative for his/her country".

Internship at **Technip France** - a world leader in project management, engineering and construction, constantly offering the best solutions and most innovative technologies to meet the world's energy challenges. Hired by Technip Ghana afterward where he is now a Deputy Site Manager

MSc PM3E

YEAR 1

MSc in Project Management for Environmental and Energy Engineering		Year 1	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
ST111TP	**Transfer phenomena**	4	
	Fluid mechanics		
	Heat transfer		
	Mass transfer		
ST211EE	**Introduction to Energy and Environmental Issues**	3	
	Energy and Environmental Policies		
	Stakeholders analysis		
	Policies/standards/regulations		
ST312EP	**Environment and process engineering**		3
	Chemical Reaction engineering applied to environmental process		
	Solid-Gas process engineering		
ST412IW	**Incineration and Waste Minimization**		3
	Incineration and Combustion processes		
	Waste Minimization and process integration		
ST512AS	**Air and Soil remediation**		3
	Flue gas treatment technologies		
	Soil treatment		
	Indoor air treatment		
	Biological gas treatment		
ST612WT	**Water Treatment processes**		4
	Biological wastewater treatment		
	Membrane processes for industrial wastewater		
	Drinking water treatment		
ST712WS	**Water Strategies and Innovation**		3
	Water strategies & innovation		
	Ppcps in the environment measure and treatment		
	Ecological sanitation		
	Low energy treatment systems		
ST812PM	**Process modelling, Simulation and Control**		4
	Process control, MATLAB for linear system and SIMULING for dynamic process control		
	Process modelling and design, with practices on two softwares		
	Modelling of pollutant dispersion in the surroundings environment		
	SOCIAL SCIENCE AND MANAGEMENT MODULES		
SSG11MF	**Management 1: foundation**	4	
	Tools for Project Manager		
	Intercultural management		
SSG11OS	**Organization science**	3	
	Introduction to organization sciences		
	Qualitative methodology		
SSG12RA	**Management 2: risk analysis and Environment Management**		4
	International environmental management		
	Risk analysis		
	SCIENTIFIC AND TECHNICAL PROJECT		
PRI11P1	**Project 1**	4	
PRI12P2	**Project 2**		4
	GENERIC METHODS FOR ENGINEERS		
MGI11FM	**Foundations of Mathematics**	4	
	Statistical basics		
	Regression		
	Math basics		
MGI11FE	**Foundations of Economics**	3	
	Fundamental of economics		
	Finance and Accounting		
MGI11IP	**Putting innovation into practice**	3	
	Management of innovation, Entrepreneurship, Business plan, Intellectual Property rights, strategy Management, Communication tools for innovation, case studies		
	FOREIGN LANGUAGES COURSES		
LVI11FL	**French language & Culture**	2	
LVI12FL	**French language & Culture**		2

MSc PM3E

YEAR 2

MSc in Project Management for Environmental and Energy Engineering		Year 2	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
ST121EE	**Thermodynamics for Energy systems**	3	
	Introduction to thermodynamics		
	Thermodynamic cycles & refrigeration		
ST221RD	**Renewables**	3	
	Solar photovoltaic		
	Solar thermal		
	Wind energy		
	Biomass resources		
	Geothermal		
ST321ES	**Energy systems**	4	
	Heat engines and boilers		
	Design and innovation in ICE Engines		
ST421EE	**Energy Efficiency and Services**	4	
	Energy efficiency in building sector		
	Energy efficiency & evaluation		
	Energy and Buildings		
	Flow resources modeling at urban scale		
ST521EN	**Energy networks**	3	
	Smart grids		
	Electricity network		
	District heating network		
ST621EM	**Energy Modelling and Optimization**	3	
	Thermoptim training		
	RETSCREEN - Technical and Economical analysis of energy options		
	E&B modelling - Comfie		
	SOCIAL SCIENCE AND MANAGEMENT MODULES		
SSG21PM	**Management 3**	4	
	Energy and environmental auditing		
	Carbon markets		
	Energy economics		
	Standardization and energy		
	SCIENTIFIC TECHNICAL PROJECT		
PRI21P3	**Project 3**	4	
	TRAINING FOR THE CORPORATE WORLD COURSES		
FEM22MT	**Master Thesis – research or Industrial Internship**		30
	FOREIGN LANGUAGES COURSES		
LVI21FL	**French language & Culture**	2	
	INDIVIDUAL / SOCIETY PROJECT COURSES		
CEP21	**Professional coaching**	X	

1 ECTS credit is equivalent to 25 hours of courses and personal work

ANWM

MSc in

ADVANCED NUCLEAR WASTE MANAGEMENT

Nuclear Engineering

The MSc in **Advanced Nuclear Waste Management** specializes in nuclear waste management. It develops fundamental scientific, technical and industrial knowledge, has a particular focus on the backend of the nuclear fuel cycle, nuclear waste management, long-term safety and environmental impact assessment and provides strong insights on dismantlement and decommissioning of nuclear installations.

Courses in English

MSc ANWN

ADVANCED NUCLEAR WASTE MANAGEMENT

Program coordinator

Prof. Abdesselam Abdelouas - abdesselam.abdelouas@imt-atlantique.fr

Research Department

SUB Atomic physics and associated TEChnologies - SUBATECH

Prerequisites

To candidate in M1- First year of Master

The international Master is open to candidates with at least a scientific Bachelor of Science degree with scientific background such as Nuclear, Chemistry, Physics, Electrical, Mechanical...

To candidate in M2 - Second year of Master

The international Master is open to candidates with at least 4 years at university Bachelor or First year of master in Nuclear Engineering.

- All Candidates must have a certificate or other proof of English proficiency (required score: TOEFL ibt 80, IELTS 6.5, TOEIC 750, Cambridge)
- A work experience is not mandatory but is a “plus” for the selection
- No prerequisite in French

General description:

The master forms engineers exposed to a highly complex scientific environment where technical expertise is omnipresent in the field of nuclear waste management. The program provides:

- The scientific knowledge necessary for nuclear waste management and the capability to understand how to assess long-term safety and environment impacts.
- The competencies to master the operational techniques and strategies for the management of nuclear waste.
- The appropriate solutions according to the type of waste through project work in industry.
- The possibility to build contacts with a large number of international key players in the field.
- The competencies to master dismantlement and decommissioning of nuclear installations.
- Societal considerations in the management of nuclear waste with regard to the public acceptance.

Career opportunities:

- Project engineer related to nuclear energy, decommissioning, nuclear waste processing, conditioning, safe storage.
- Manager of nuclear waste in industrial, hospitals or research institutions.
- Research scientist and development engineer.
- Safety engineer for radioactive waste management solutions.
- Regulators for governmental control of waste management practices.
- Engineer of international agencies involved in nuclear waste issues.

Website : www.imt-atlantique.fr/sneam

Contact : sneam-admission@imt-atlantique.fr

Online application : https://sneam.imt-atlantique.fr

Head of the Research Department

Prof. Bernd GRAMBOW

Professor of excellence at IMT Atlantique, France. He graduated at the Freie Universität Berlin, worked for one year at the Pacific Northwest National Laboratory (WA, USA) followed by research positions in Hahn Meitner Institute Berlin and Forschungszentrum Karlsruhe. He holds today the Chair on nuclear waste disposal in Nantes and is head of the Subatech laboratory in Nantes, France, a laboratory working on high energy nuclear physics, on nuclear medicine and radiochemistry. SUBATECH is a mixed research unit between the CNRS-IN2P3, the IMT Atlantique and the University of Nantes. Coordinator of various European projects and former director of the national CNRS-academic/industrial research network NEEDS "nuclear: environment, energy, waste, society", his areas of scientific expertise are radiochemistry, nuclear waste disposal science, geochemical modeling, radionuclide migration in the environment, chemical thermodynamics, and dynamics of solid/liquid interfaces. He published 143 peer reviewed research papers. In 2008 he received the Grand Prix Ivan Pechès of the French Academie of Science and in 2013 he became Chevalier of the Ordre des Palmes Académiques.

Examples of Master thesis

Nurul Ida Suhana LIAS (Malaysia) - **Malaysian Nuclear Agency**
Assessment of preferred scenario for the disposal of future spent fuel.

Elsa GONTHIER (France) - **EDF (Electricity of France)**
Transfer of the dismantling scenario of Saint-Laurent A2 NUGG reactor to Saint-Laurent A1.

Sanjey DUBEY (India) - **Karlsruhe Institute for Technology, Germany**
Development of a reactive transport model accounting for (geo-)chemical and physical processes taking place in the near-field of a spent nuclear fuel (SNF) repository in a deep clay rock formation.

Alumni testimony, 2014-2016 batch

Pamela LOPEZ (Argentina)

"From the academic perspective, I really liked all the exciting lectures and the technical visits that we did. I was able to comprehend the French nuclear network and make a lot of contacts for my future. Moreover this Master and the internship at **EDF** have given me the technical understanding to decide exactly what I want to do in my professional life."

MSc ANWM

YEAR 1

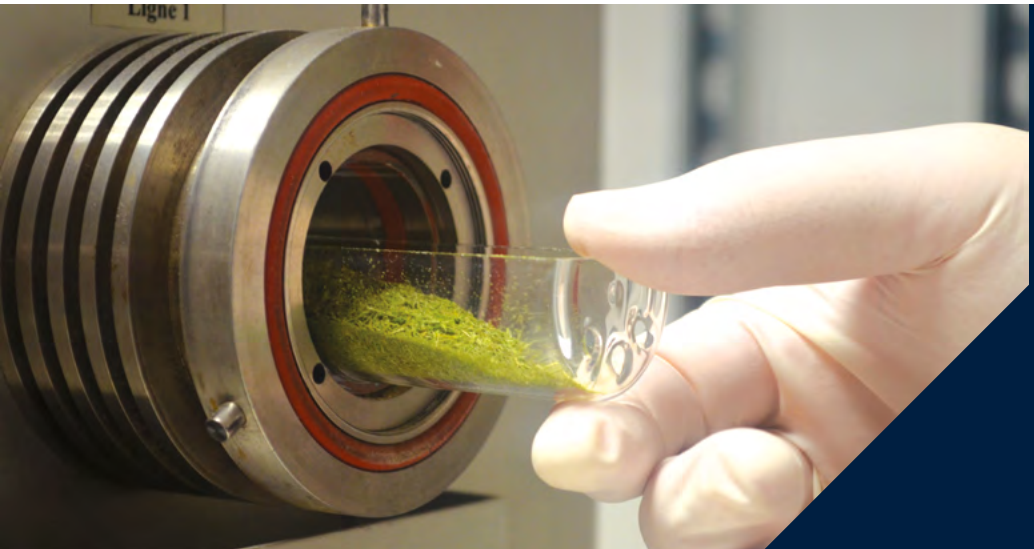
MSc in Advanced Nuclear Waste Management		Year 1	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL COURSES	European Credit - ECTS	
ST111IR	**Physics of ionizing radiations**	5	
	Nuclear physics and radioactivity, interaction of radiation with matter, dosimetry		
ST211DR	**Detection of ionizing radiations**	3	
	Principles of ionizing radiation detection, different types of detectors, practical work		
ST311NM	**Introduction to nuclear modeling**	3	
	Review of selected computer languages, Monte Carlo methods, principles of nuclear modeling, practical computer work		
ST411NP	**Introduction to neutron physics**	3	
	Cinematics of particle transport, criticality, one group diffusion equation, geometrical Buckling principles of nuclear modelling, practical computer work		
ST212RP	**Radioprotection**		6
	Principals of radioprotection		
	Work practices		
	Simulation		
ST312RA	**Physico-chemistry of Environment**		7
	Environment and Radioactivity		
	Introduction to Radiochemistry		
	Detectors and Radiochemical Analyses		
ST412NT	**Introduction to Nuclear Technology**		4
	Nuclear reactors		
	Accelerators		
	Fuel cycle and nuclear materials		
	SOCIAL SCIENCE AND MANAGEMENT		
SSG11MO	**Management**	4	
	Theory of organizations, human and organizational factors, case studies		
SSG11ET	**Energy mix and energetic transition**	2	
	Introduction to energy production, international treaties, scenarios for transition		
SSG12NM	**Environmental Management and strategy of Sustainability**		7
	International environmental management		
	Energy strategies		
	Sustainability management		
	Risk analysis		
	SCIENTIFIC AND TECHNICAL PROJECT COURSES		
PRI11NP	**Integrated Scientific project**	3	
PRI12NP	**Integrated Nuclear Engineering project**		3
	TRAINING FOR THE CORPORATE WORLD		
FEM11VS	**Company visits and seminars 1**	1	
FEM12VS	**Company visits and seminars 2**		1
	GENERIC ENGINEERING METHODS		
MGI11DA	**Measurement and Data analysis**	4	
	FOREIGN LANGUAGES		
LVI11FL	**French language & Culture**	2	
LVI12FL	**French language & Culture**		2

MSc ANWM

YEAR 2

MSc in Advanced Nuclear Waste Management		Year 2	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
ST121WS	**Wastes, conditioning and Storage**	7	
	Inventories of waste and classification		
	Waste characterization and conditioning		
	Storage concepts and sites		
ST221DD	**Dismantlement and Decommissioning of Nuclear Installations**	4	
	Dismantlement strategies and projects		
	Dismantlement scenario		
	Radiological inventories		
	Costs assessment		
ST321GD	**Geological disposal**	7	
	Geology and hydraulics		
	Repository technology		
	Engineered barrier system		
	Phenomenology of evolution		
ST421SA	**Safety**	5	
	Geochemical and transport modelling		
	Transfer to human beings		
	Performance and safety		
	Radioprotection		
	Environmental impact		
	SOCIAL SCIENCE AND MANAGEMENT MODULES		
SSG21NS	**Nuclear: Management, Safety and Society**	5	
	Institutional framework, actors		
	Socioeconomic and ethical aspects		
	Sustainable nuclear development		
	Project management		
	TRAINING FOR THE CORPORATE WORLD		
FEM22MT	**Master thesis**		30
	FOREIGN LANGUAGES		
LVI21FL	**French language and Culture**	2	
	INDIVIDUAL / SOCIETY PROJECT COURSES		
CEP21	**Professional coaching**	X	

1 ECTS credit is equivalent to 25 hours of courses and personal work



NEPIA

MSc in

NUCLEAR ENERGY PRODUCTION AND INDUSTRIAL APPLICATIONS

Nuclear Engineering

The MSc in **Nuclear Energy Production & Industrial Applications** specializes in nuclear sciences applications including energy production (power reactors) and industrial applications (particles beams technology, instrumentation ...). The combination of scientific and technical skills with management knowledge and strong safety culture (human factor and organizational safety) is meant to put the human being and environment safety as the priority number one.

Courses in English

MSc NEPIA

NUCLEAR ENERGY PRODUCTION AND INDUSTRIAL APPLICATIONS

Program coordinator

Prof. Abdesselam Abdelouas - abdesselam.abdelouas@imt-atlantique.fr

Research Department

SUB Atomic physics and associated TEChnologies - SUBATECH

Prerequisites

To candidate in M1- First year of Master

The international Master is open to candidates with at least a scientific Bachelor of Science degree with scientific background such as Nuclear, Chemistry, Physics, Electrical, Mechanical...

To candidate in M2 - Second year of Master

The international Master is open to candidates with at least 4 years at university Bachelor or First year of master in Nuclear Engineering.

- All Candidates must have a certificate or other proof of English proficiency (required score: TOEFL ibt 80, IELTS 6.5, TOEIC 750, Cambridge)
- A work experience is not mandatory but is a “plus” for the selection
- No prerequisite in French

General description

- Acquire basic knowledge necessary for understanding nuclear energy production (power reactors) and industrial applications, e.g. accelerators, cyclotrons...
- Develop competences in reactor operation, maintenance and safety issues including radioprotection.
- Develop competences in particles beams production and qualification.
- Develop competences in nuclear radiations applications: instrumentation, non destructive control, security...
- Develop an awareness of societal considerations related to nuclear energy production.
- Take into account societal issues related to nuclear energy production.

Career opportunities

- Project engineer related to nuclear energy.
- Operation and maintenance engineer in power plant and other industrial applications.
- Safety engineer in nuclear power plant operation and industrial installations, and environmental controls.
- Research scientist and development engineer for industrial installations and power plants.

Website : www.imt-atlantique.fr/sneam

Contact : sneam-admission@imt-atlantique.fr

Online application : https://sneam.imt-atlantique.fr

MSc IN NUCLEAR ENERGY PRODUCTION AND INDUSTRIAL APPLICATIONS

Head of the Research Department

Prof. Bernd GRAMBOW

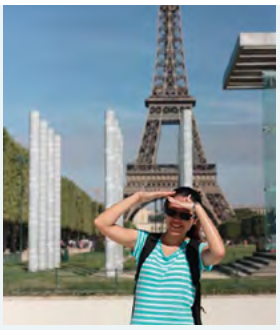
Professor of excellence at IMT Atlantique, France. He graduated at the Freie Universität Berlin, worked for one year at the Pacific Northwest National Laboratory (WA, USA) followed by research positions in Hahn Meitner Institute Berlin and Forschungszentrum Karlsruhe. He holds today the Chair on nuclear waste disposal in Nantes and is head of the Subatech laboratory in Nantes, France, a laboratory working on high energy nuclear physics, on nuclear medicine and radiochemistry. SUBATECH is a mixed research unit between the CNRS-IN2P3, the IMT Atlantique and the University of Nantes. Coordinator of various European projects and former director of the national CNRS-academic/industrial research network NEEDS "nuclear: environment, energy, waste, society", his areas of scientific expertise are radiochemistry, nuclear waste disposal science, geochemical modeling, radionuclide migration in the environment, chemical thermodynamics, and dynamics of solid/liquid interfaces. He published 143 peer reviewed research papers. In 2008 he received the Grand Prix Ivan Pechès of the French Academie of Science and in 2013 he became Chevalier of the Ordre des Palmes Académiques.

Examples of Master thesis

Michal Konrad RAPALA (Poland) - **European Atomic Commission**
Research on nuclear fission of Uranium-235 based on spectrometry of prompt gammas.

Venkata Gurnath NADELLA (India) - **Indira Ghandi Centre for Atomic Research**
Design and development of simulator for Sodium-Water Reaction test facility

Vasily KOVTUNOV (Russia) - **International Atomic Energy Agency**
International preparedness and response to a nuclear and/or radiological emergency.



Alumni's testimony, 2013-2014 Double-Degree student

DONG Yemin (China)

"France has been a leader country in terms of Nuclear technology for years. The Master program really reflects this advanced-level, you can experience it everyday of your study."

MSc NEPIA

YEAR 1

MSc in Nuclear Energy Production and Industrial Applications		Year 1	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL COURSES	European Credit - ECTS	
ST111IR	**Physics of ionizing radiations**	5	
	Nuclear physics and radioactivity, interaction of radiation with matter, dosimetry		
ST211DR	**Detection of ionizing radiations**	3	
	Principles of ionizing radiation detection, different types of detectors, practical work		
ST311NM	**Introduction to nuclear modeling**	3	
	Review of selected computer languages, Monte Carlo methods, principles of nuclear modeling, practical computer work		
ST411NP	**Introduction to neutron physics**	3	
	Cinematics of particle transport, criticality, one group diffusion equation, geometrical Buckling principles of nuclear modelling, practical computer work		
ST212RP	**Radioprotection**		6
	Principals of radioprotection		
	Work practices		
	Simulation		
ST312RA	**Physico-chemistry of Environment**		7
	Environment and Radioactivity		
	Introduction to Radiochemistry		
	Detectors and Radiochemical Analyses		
ST412NT	**Introduction to Nuclear Technology**		4
	Nuclear reactors		
	Accelerators		
	Fuel cycle and nuclear materials		
	SOCIAL SCIENCE AND MANAGEMENT		
SSG11MO	**Management**	4	
	Theory of organizations, human and organizational factors, case studies		
SSG11ET	**Energy mix and energetic transition**	2	
	Introduction to energy production, international treaties, scenarios for transition		
SSG12NM	**Environmental Management and strategy of Sustainability**		7
	International environmental management		
	Energy strategies		
	Sustainability management		
	Risk analysis		
	SCIENTIFIC AND TECHNICAL PROJECT COURSES		
PRI11NP	**Integrated Scientific project**	3	
PRI12NP	**Integrated Nuclear Engineering project**		3
	TRAINING FOR THE CORPORATE WORLD		
FEM11VS	**Company visits and seminars 1**	1	
FEM12VS	**Company visits and seminars 2**		1
	GENERIC ENGINEERING METHODS		
MGI11DA	**Measurement and Data analysis**	4	
	FOREIGN LANGUAGES		
LVI11FL	**French language & Culture**	2	
LVI12FL	**French language & Culture**		2

MSc NEPIA

YEAR 2

MSc in Nuclear Energy Production and Industrial Applications		Year 2	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
ST121BR	**Basics for reactors**	7	
	Neutronics		
	Thermohydraulics		
	Simulation (the SERPENT code)		
ST221DD	**Dismantlement and Decommissioning of Nuclear Installations**	4	
	International framework and case studies		
	The French dismantlement program		
	Decontamination		
ST321NM	**Nuclear materials**	3	
	Nuclear fuel		
	Aging and steel corrosion		
	Nuclear waste forms		
ST421OM	**Operation & maintenance**	9	
	Introduction to nuclear reactors		
	Safety: design, operation, maintenance		
	Radiation protection		
	Training on simulator		
	Advanced nuclear technologies		
	SOCIAL SCIENCE AND MANAGEMENT MODULES		
SSG21NS	**Nuclear: Management, Safety and Society**	5	
	Institutional framework, stakeholders		
	Socioeconomic and ethical aspects		
	Sustainable nuclear development		
	Project management		
	TRAINING FOR THE CORPORATE WORLD		
FEM22MT	**Master Thesis – research or Industrial Internship**		30
	FOREIGN LANGUAGES		
LVI21FL	**French language and Culture**	2	
	INDIVIDUAL / SOCIETY PROJECT COURSES		
CEP21	**Professional coaching**	X	

1 ECTS credit is equivalent to 25 hours of courses and personal work

NUCLEAR MEDICAL APPLICATIONS

MSc in

IONIZING RADIATION & MEDICAL PHYSICS

Nuclear Engineering

The MSc in **Nuclear Medical Applications** develops fundamental scientific, technical and industrial knowledge of the different nuclear technologies used in the medical field. It has a particular focus on the safety and radioprotection, to be considered in the management of a large project in this field.

Year 1 : Courses in English

Year 2 : Semester 1 - Courses in French

MSc IN NUCLEAR MEDICAL APPLICATIONS

IONIZING RADIATION AND MEDICAL PHYSICS

Program coordinator

Prof. Abdesselam Abdelouas - abdesselam.abdelouas@imt-atlantique.fr

Research Department

SUB Atomic physics and associated TEChnologies - SUBATECH

Prerequisites

To candidate in M1- First year of Master

The international Master is open to candidates with at least a scientific Bachelor of Science degree with scientific background such as Nuclear, Chemistry, Physics, Electrical, Mechanical...

To candidate in M2 - Second year of Master

The international Master is open to candidates with at least 4 years at university Bachelor or First year of master in Nuclear Engineering.

- All Candidates must have a certificate or other proof of English proficiency (required score: TOEFL ibt 80, IELTS 6.5, TOEIC 750, Cambridge)
- A work experience is not mandatory but is a “plus” for the selection
- No prerequisite in French

General description

This specialization develops fundamental scientific, technical and industrial knowledge of the different nuclear technologies used in the medical world. It has a particular focus on the safety and radioprotection, to be considered in the management of a large project in this field.

Objectives:

- Acquire the basic scientific knowledge relative to nuclear technologies, necessary for understanding their utility and danger in medical applications (diagnosis and therapy).
- Develop competences in beam and radionuclide production
- Develop competences in medical imaging, dosimetry and radiation protection
- Master the operational techniques and strategies for the management of a project in nuclear medicine. Implement appropriate solutions through projects in/with industry
- Build contacts with a large number of international key players in the field

Develop an awareness of societal considerations related to nuclear medicine.

Career opportunities

Nuclear project in a medical environment, by knowing not only all the technical aspects but also the goal of the application and its dangers. This sound basis

- Allows to become the main contact between the industrial and medical worlds, exerting for example as biomedical engineer or engineer of a medical facility
- Allows to be qualified to fulfill the requirements of the quality control that will be soon obligatory in the centers of radiology and radiotherapy. In accordance with current legislation in various states, the formation will enable to fill the function of hospital physicist.

Service of radiation protection in a nuclear center.

R & D engineer in nuclear and medical instrumentation industry

Website : www.imt-atlantique.fr/sneam

Contact : sneam-admission@imt-atlantique.fr

Online application : https://sneam.imt-atlantique.fr

Head of the Research Department

Prof. Bernd GRAMBOW

Professor of excellence at IMT Atlantique, France. He graduated at the Freie Universität Berlin, worked for one year at the Pacific Northwest National Laboratory (WA, USA) followed by research positions in Hahn Meitner Institute Berlin and Forschungszentrum Karlsruhe. He holds today the Chair on nuclear waste disposal in Nantes and is head of the Subatech laboratory in Nantes, France, a laboratory working on high energy nuclear physics, on nuclear medicine and radiochemistry. SUBATECH is a mixed research unit between the CNRS-IN2P3, the IMT Atlantique and the University of Nantes. Coordinator of various European projects and former director of the national CNRS-academic/industrial research network NEEDS "nuclear: environment, energy, waste, society", his areas of scientific expertise are radiochemistry, nuclear waste disposal science, geochemical modeling, radionuclide migration in the environment, chemical thermodynamics, and dynamics of solid/liquid interfaces. He published 143 peer reviewed research papers. In 2008 he received the Grand Prix Ivan Pechès of the French Academie of Science and in 2013 he became Chevalier of the Ordre des Palmes Académiques.

Examples of Master thesis

Raviteja NANABALA (India) - European Atomic Commission
Automated synthesis of 11C-Radiopharmaceuticals for Positron Emission Tomography.

Emilie ARNOULT (France) - GE Healthcare
Study of contribution of the pre-operative imaging during heart valves implantation procedures.

Shixi ZHAO (China) - IMT Atlantique Research Department
Data analysis of XEMIS1prototype, a new liquid xenon camera for nuclear medical imaging.

Alumni's testimony, 2012-2014 batch

Mohammad Nazri Abdul Rahman (Malaysia)

"France is one of the recognized experts in nuclear technology, the professional experiences will be the highlights in my CV and the personal experiences will boost my self confidence. The course deepen my knowledge in nuclear medical field and with better understanding, it initiates more interest to keep learning. I'm preparing to further for PhD next year."

MSc in NUCLEAR MEDICAL APPLICATIONS

YEAR 1

MSc in Nuclear Medical Applications		Year 1	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL COURSES	European Credit - ECTS	
ST111IR	**Physics of ionizing radiations**	5	
	Nuclear physics and radioactivity, interaction of radiation with matter, dosimetry		
ST211DR	**Detection of ionizing radiations**	3	
	Principles of ionizing radiation detection, different types of detectors, practical work		
ST311NM	**Introduction to nuclear modeling**	3	
	Review of selected computer languages, Monte Carlo methods, principles of nuclear modeling, practical computer work		
ST411NP	**Introduction to neutron physics**	3	
	Cinematics of particle transport, criticality, one group diffusion equation, geometrical Buckling principles of nuclear modelling, practical computer work		
ST212RP	**Radioprotection**		6
	Principals of radioprotection		
	Work practices		
	Simulation		
ST312RA	**Physico-chemistry of Environment**		7
	Environment and Radioactivity		
	Introduction to Radiochemistry		
	Detectors and Radiochemical Analyses		
ST412NT	**Introduction to Nuclear Technology**		4
	Nuclear reactors		
	Accelerators		
	Fuel cycle and nuclear materials		
	SOCIAL SCIENCE AND MANAGEMENT		
SSG11MO	**Management**	4	
	Theory of organizations, human and organizational factors, case studies		
SSG11ET	**Energy mix and energetic transition**	2	
	Introduction to energy production, international treaties, scenarios for transition		
SSG12NM	**Environmental Management and strategy of Sustainability**		7
	International environmental management		
	Energy strategies		
	Sustainability management		
	Risk analysis		
	SCIENTIFIC AND TECHNICAL PROJECT COURSES		
PRI11NP	**Integrated Scientific project**	3	
PRI12NP	**Integrated Nuclear Engineering project**		3
	TRAINING FOR THE CORPORATE WORLD		
FEM11VS	**Company visits and seminars 1**	1	
FEM12VS	**Company visits and seminars 2**		1
	GENERIC ENGINEERING METHODS		
MGI11DA	**Measurement and Data analysis**	4	
	FOREIGN LANGUAGES		
LVI11FL	**French language & Culture**	2	
LVI12FL	**French language & Culture**		2

MSc in NUCLEAR MEDICAL APPLICATIONS

YEAR 2

MSc in Nuclear Medical Applications		Year 2	
		Sem 1	Sem 2
CODE	SCIENTIFIC AND TECHNICAL MODULES	European Credit - ECTS	
X9PA010	**Nuclear Reactions and Radiations**	4	
	Nuclear reactions		
	Particle Beams and Radiation Production		
	Radiation Interaction in Matter		
	Detection		
X9PA020	**Mathematical Tools and Computer Simulation**	4	
	Mathematical Tools for Data Analysis and Image Processing		
	Monte Carlo Simulation Technique		
	Computing Project		
X9PA040	**Effects of Ionizing Radiation and Radiation Protection**	2	
	Biological Effects of Radiation		
	Radiolysis		
X9PA110	**Basics of Medical Physics and Imaging**	2	
	Introduction to Medical Physics		
	Introduction to Medical Imaging (including MRI and Ultrasound)		
	Radiopharmaceutical and Clinical Applications		
X9PA130	**Dosimetry**	4	
	Radiology		
	Nuclear Medicine		
	Image Processing		
	GATE Simulation		
X9PA120	**Medical Imaging Techniques**	4	
	Fundamentals on Dosimetry		
	Dosimetry Protocols		
	Calculation Algorithms		
	Dosimetry in Radiology, Brachytherapy and Nuclear Medicine		
	SOCIAL SCIENCE AND MANAGEMENT MODULES		
SSG21NS	**Nuclear: Management, Safety and Society**	5	
	Risk Assessment		
	Sustainable Nuclear development		
	Project Management		
X9PA050	**Applications, Quality and Project Management**	3	
	Industrial Applications		
	Quality Approach		
	Project Management		
	SCIENTIFIC AND TECHNICAL MODULES		
FEM22MT	**Master Thesis – Research, Hospital or Industrial Internship**		30
	FOREIGN LANGUAGES		
LVI21FL	**French language and Culture**	2	
	INDIVIDUAL / SOCIETY PROJECT COURSES		
CEP21	**Professional coaching**	X	

1 ECTS credit is equivalent to 25 hours of courses and personal work


AMAZING
Vans

SYLLABUS

List of modules of the MSc programs

CEP: Individual/Society project

CEP21: Professional coaching

ECTS	Language	Degree	Program	Year	Semester
0	English	Master	MOST - PM3E - NUCLEAR	2	1

Objectives:

Analysis of the student's academic history (education and training) and any professional or personal work experience. Identification of personal, social, and organizational qualities and skills as well as any other competencies. Development of a professional project that is true and realistic/possible to acquire for each student. To make students' skills and professional objectives attractive. To get to know how to promote and sell it. To display the know-how and to customize the tools (CV, cover letter, interviews, job seeking methods) necessary for students placement and mobility and professional integration.

Content:

Identification of the cultural context and the different customized ways of seeking a job in the various regions of the world. Individual sessions and collective sessions (15 students / group max)
The students are working with their own personal materials: working experience, educational background, CV, pre selected offers and cover letters. Just some readymade exercises and some self-training.

FEM: Training for Corporate World

FEM11VS – FEM12VS – FEM21VS: Company visits and seminars

ECTS	Language	Degree	Program	Year	Semester
1	English	Master	NUCLEAR	1	1
1	English	Master	NUCLEAR	1	2
1	English	Master	MOST	1	1
1	English	Master	MOST	1	2
1	English	Master	MOST	2	1

Objectives:

To illustrate the scientific and technical courses with real industrial examples. In addition, professional and experts are invited to give conferences on specific technical or management topics, with reference to their ground experience and practical difficulties or obstacles that might have been encountered.

Content:

SNEAM > visits: nuclear research center, nuclear installations, waste management unit, nuclear power plant, cyclotron of Nantes, GANIL, Pantechnik
The students are working with their own personal materials: working experience, educational background, Cv, pre selected offers and cover letters. Just some readymade exercises and some self-training.
Examples of Conference Topics:
Environment and radiation, Water Networks, toxicology and radiotoxicology, Combining renewable and Nuclear Energies, hydrogen Production by nuclear means.
MOST > seminars on selected innovative topics and field visits to companies on topics relevant to the program

FEM22MT: Master Thesis – Research or Industrial Internship

ECTS	Language	Degree	Program	Year	Semester
30	English	Master	MOST - PM3E - NUCLEAR	2	2

Objectives:

Crowning achievement of the studies, the professional project is the springboard towards professional activity. According to one's personal career objective, every student can choose to carry out either an industrial or research project for a period of 6 months. The Master thesis gives the opportunity to get a consistent professional experience as an engineer in a company, an institution or a laboratory, having activities in the area of the Master. The mission assigned must answer a real industrial need, whilst the results obtained have to bring a real added value. Aside demonstration of the ability of the student to use technical and engineering knowledge, the exercise enables to evaluate in a professional situation the individual management skills, as well as the inter and intra personal qualities.

Content:

The subject must include:

- Technical, scientific achievements (conception, design, optimization, improvement of processes, industrial units, farms…)
- And/or implementation of new methodologies, or systems of management (hygiene, safety and environment (HSE), risk…)
- Analysis of the global context, by considering the economical, financial, social, human, cultural, geographical, policy and regulations aspects
- All along the duration of the project, the student is supervised by two tutors:
- One in the company or the laboratory, who defines the missions and guarantee an adequate environment for the development of the student's work
- Another one from IMT Atlantique, who (as an academic referee), may advise or support the student during the project

At the end of the project, a Master thesis is submitted by the student to both the tutors. this is followed with an oral defense in front of a jury. The global evaluation of the exercise is based on the partial assessments made by each tutor and the jury of the defense.

LVI: foreign language

LVI11FL – LVI12FL - LVI21FL: French Language and Culture

ECTS	Language	Degree	Program	Year	Semester
2	English	Master	MOST	1	1
2	English	Master	MOST	1	2
2	English	Master	MOST	2	1
2	English	Master	PM3E	1	1
2	English	Master	PM3E	1	2
2	English	Master	PM3E	2	1
2	English	Master	NUCLEAR	1	1
2	English	Master	NUCLEAR	1	2
2	English	Master	NUCLEAR	2	1

Objectives:

To make the students able to communicate in French in current life, for job interviews and in professional situations (meetings and working reports). To support their social, cultural and professional integration by a better knowledge of French culture. At the end of the course, students will get a French diploma (TEF, test d'Evaluation de Français) assessing their language proficiency.

Content:

Intensive trainings are scheduled periodically along the 3 academic semesters of the Master course, as well as regular classes, once a week. Students are divided into small groups, depending on their French level. Oral participation is favoured. Visits and social events are also organized to give the students the opportunity to meet French people, and discover some cultural aspects of Nantes and its region.

MGI: Generic Method for Engineers

MGI11DA: Measurement and Data Analysis

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	NUCLEAR	1	1

Objectives:

To make the students familiar with the experimental investigation, measurement methods and instrumentation, process operating control and treatment of data. The course emphasizes the use of statistical tools for data analysis and elaboration of predictive models. At the end of the course, the students know how to define an experimental methodology, exploit and interpret results to solve an engineering or scientific problem.

Content:

- Statistical Data Modeling: descriptive statistics, data set processing, probability, simple & multiple linear regressions, neural network
- Experimental Methodology: experiment formulation, experimental design, dimensional analysis, data analysis & collection
- Measure & Control: process/industrial instruments, measure of physical variables, sensors, transducers, data acquisition systems, feedback control systems, transfer function models, stability and precision assessment, PId controller

MGI11FE: Foundations of Economics

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	1

Objectives:
To understand the contemporary economic systems and their influence on the processes of managerial decisions. To learn the basic concepts and techniques of accountancy in order to facilitate the communication with accountants, financial managers, bankers and auditors.

Content:
- Fundamental of economics: Global economy, supply & demand, GDP and standard of living, labor markets and unemployment, investments & savings, economic growth, foreign trade and international economics.
- Finance & Accounting: Accounting basic principles, financial statements, assets, liabilities and shareholders' equity, role of the financial manager, investment decisions capital markets, debt policy and firm value, case studies.

MGI11FM: Foundations of Mathematics

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	1

Objectives:
To ensure the minimum knowledge required in mathematics and statistics for specific lectures in energy and environment.

Content:
- Statistical Basics: Descriptive statistics, data set processing, probability
- Regression: Simple and multiple linear regression
- Math Basics: Analysis, Laplace/Fourier Transform, Partial derivate and Differential equations, Linear Algebra

MGI11IP: Putting Innovation into Practice

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	1

Objectives:
To gain the basic knowledge necessary to build its own professional company, to become familiar with the rules and laws of Intellectual Property rights, to gain basics in entrepreneurship and its implementation.

Content:
Management of innovation, Entrepreneurship, Business plan, Intellectual Property rights, Strategy Management, Communication tools for innovation, Case studies

PRI: Scientific and Technical project

PRI11NP: Integrated Scientific Project

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	1	1

Objectives:
To learn in practice how to set up an experimental methodology in order to solve an engineering or scientific problem. The project gives the students the opportunity to apply the theoretical knowledge acquired in the UV-MGI and ST1, to develop an operational know-how and to get an initiation in research. They will also learn how to present a scientific work both in the oral and writing forms.

Content:
Every project group (3 students) will be assigned a tutor who proposes a subject and is in charge of supervising the whole process. the project will include different phases:
- literature analysis
- methodology and experimental procedure
- tests to be carried out and experimental data analysis
- scientific report and oral presentation.

PRI11P1: Project 1

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	1

Objectives:

To gain the basic knowledge necessary to build its own professional company, to become familiar with the rules and laws of Intellectual Property rights, to gain basics in entrepreneurship and its implementation.

Content:

Case 1: Every project group (3-4 students) will be assigned a part of a subject. A team work inside the group and with the other sub groups will provide the overall work.
Feedback on the experience of learning by doing in the field of project management will used through regular milestones. Main subject and sub subjects are updated each year by the pedagogical team.
Following this path each semester (moreover in case of a 4th semester done in a company), the Master done by the students will be similar to a Master of Engineering.
Case 2: In link with the pedagogical team, it can be possible for selected number of voluntary students to design this Project and the two other ones (in the 2nd and 3rd semesters) as a research activity. the subject must be in link with the research activity of the DSEE in order to ensure a good supervision of the students. Added to a 4th semester done in a laboratory these 3 research projects provide the master a research touch similar to the one provided in a Master of Science.

PRI12NP: Integrated Nuclear Engineering Project

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	1	2

Objectives:

This team project allows the students to apply their knowledge to solve an engineering problem. The students learn how to manage a project and how to work within a team. A thesis will be prepared by the students who then will defend their work in front of a committee.

Content:

- A nuclear engineering project dedicated to design, modelling, control of an industrial process applied for effluent treatment, radioprotection or nuclear materials properties assessment will be realized to complete this course. The project is conducted within SUBATECH department and each project is carried out by a team of 3 students, and supervised by a tutor. The project will already show a coloration of the future option:
- The ANWM project will focus on the modelling of radionuclide migration in different geological formations.
- The NEPIA project will focus on the modelling of the neutronical aspects of the description of the core of a nuclear power plant or other industrial applications by use of a microscopic transport calculation.
- The RIA project will focus on the interaction of radiation with matter for medical applications by use of the GEANT4 toolkit

PRI12P2: Project 2

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	2

Objectives:

To apply technical knowledge, engineering tools for process design and control and to learn to optimize organization of work in a project team.

Content:

Case 1: An engineering project dedicated to design, modeling, control of an industrial process applied for solid, air or water treatment, or energy recovery will be realized to complete this course. Each project is carried out by a team of 3 students and supervised by a tutor
As for the 1st semester, by following this path (moreover in case of a 4th semester done in a company), the Master done by the students will be similar to a Master of Engineering.
Case 2: As mentioned for the 1st semester, in link with the pedagogical team, it can be possible for selected number of voluntary students to design this Project as a research activity. The subject must be in link with the research activity of the DSEE in order to ensure a good supervision of the students. Added to a 4th semester done in a laboratory these 3 research projects provide the master a research touch similar to the one provided in a Master of Science.

PRI12SC: Operation research 2

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	1	2

Objectives:
To be able to apply operations research techniques to model and solve a typical supply chain, production or transport problem.

Content:
Project work by small groups on specific topics proposed by the lecturer. Modeling and solving of problems using optimization software or algorithmic development. Critical analysis and presentation of results.

PRI21P3: Project 3

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	2	1

Objectives:
To be able to gather relevant information about a given subject, to be able to provide pedagogical materials, to be able to “teach” the audience.

Content:
Case 1: A part of a course given by a regular lecturer is identified to become a subject for a group of 3 students (and removed from his/her course). The group has to work in strong link with the lecturer in order to prepare and present this part of the course to the rest of the class. As for the 1st semester, by following this path (moreover in case of a 4th semester done in a company), the Master done by the students will be similar to a Master of Engineering.
Case 2: As mentioned for the 1st semester, in link with the pedagogical team, it can be possible for selected number of voluntary students to design this Project as a research activity. the subject must be in link with the research activity of the DSEE in order to ensure a good supervision of the students. Added to a 4th semester done in a laboratory these 3 research projects provide the master a research touch similar to the one provided in a Master of Science.

PRI21SC: Supply Chain Integrated Project

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	2	1

Objectives:
To be able to study a novative problem of SCM, conduct a state of art survey and develop specific solutions and proposals in an integrated, multidisciplinary way. To be able to write a report and defend it in public.

Content:
Tutored projects in small groups on specific novative topics leading to a project report and possible implementation. Topics may be research problems or practical problems posed by a firm.

SSG: Social Science and Management Modules

SSG11EM: Introduction to Supply Chain Engineering and Management

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	1	1

Objectives:
To be able to understand and master the context, goals , organization and methodologies of SCM’s in a competitive environment and sustainable development.

Content:
Fundamental concepts of supply chain management, production, distribution and transport systems: goals, physical and information flows, planning methods, performance evaluation.
Module 1: Fundamentals of Supply Chain Management.
Module 2: Distribution and warehousing management and organization.
Module 3: Transport management and organization.

SSG11ET: Energy mix and Energy transition

ECTS	Language	Degree	Program	Year	Semester
2	English	Master	NUCLEAR	1	1

Objectives:

This course gives an overview of energy sources and production as well as energy consumption and the mix of sources used. In the economic perspective on energy systems, the focus is more on how decisions of consumers and producers result in changes in the use of energy and on how energy consumption is related to other economic activities. The course also concerns the international trends related to energy transition for more renewable and mess consumption.

Content:

- Energy sources and energy mix
- International treaties
- Energy transition

SSG11MF: Management 1: Foundation

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	1

Objectives:

To understand the reason of a project in link with the company activity. To be able to have a global view of a project with all its aspects. To master usual tools (informatics) for project manager. To manage team mobilized for a project. To acquire the methods and practices required to manage a project within a complex and international framework; different aspects are described: life cycle, reference documents, project contract, team project, supervision, cost control, performance, deadlines and risk management.

Content:

Tools for project Manager: Communication Management, risk Management, Conflict Management, team Building, Leadership – Project Manager Behaviors, Closing and Project Knowledge Management, tools for Project Manager (MS project) Intercultural Management: Self awareness, perception of self and the other, stereotypes, cultural variables, ethnocentrism to ethno relativism, intercultural communication, cultural profiles and business environment.

SSG11MO: Management

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	NUCLEAR	1	1

Objectives:

To acquire the methods and practices required to manage a project within a complex and international framework. Different aspects are described: life cycle, reference documents, project contract, team project, supervision, cost control, performance, deadlines and risks management. In addition, the course aims at helping participants to work effectively and to negotiate in intercultural settings, through a better understanding of their own cultural conditioning and awareness of the differences in management and conflict styles throughout the world.

Content:

- Project Management: organization and project structure, project piloting: performances, time, cost, risk analysis and opportunities, real case exercise (contract selection), quality aspects, project simulation and reporting, practical case studies with use of MS project software.
- Intercultural Management: self-awareness, perception of self and the other; stereotypes, cultural variables, ethno-centrism to ethno-relativism, intercultural communication, cultural profiles and business environments.
- International Negotiations: actors and processes, instrumental and behavioural aspects, stake, conflict, convergences and divergences, consultation, confrontation and conciliation.

SSG11OS: Organization Science

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	1

Objectives:

To understand sociology analysis of organizations and operational units in industry, the relationships and impacts in a project development.

Content:

Intro to Organization Sciences: Actors and strategies, definitions of Organization, Project dynamics and time aspects, case studies
Qualitative Methodology: how to collect non formalized data, how to prepare and drive an interview.

SSG11SP: Strategy and project management

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	1

Objectives:
To be able to understand and practice the goals and methodologies of the strategy of the firm applied to SCM and the techniques of project management. To be able to work in teams in an intercultural, international environment.

Content:
Strategy of the firm, project management techniques and in an intercultural environment, communication and team working.
Module 1: Strategy of the firm
Module 2: Project management.
Module 3: Intercultural project management.
Module 4: Communication and team work 1: Communication modes and appropriate selection, listening and responding skills, communication with an audience, selling and negotiation skills, team building, setting targets and support provisions, improving team efficiency and motivation, good practices, problems and conflicts resolution.

SSG12EF: Economics, Marketing, Finance and Organization

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	1	2

Objectives:
To be Able to use the concepts, methods and tools of Economics, Marketing, Finance & Organization applied to supply chain management.

Content:
Economics, Finance & Accounting / Marketing / Human ressources management / Organization of the firm and sociology of organization / Commmunication and team Work 2. Motivation, good practices, problems and conflicts resolution.

SSG12NM: Environmental Management and strategy of Sustainability

ECTS	Language	Degree	Program	Year	Semester
7	English	Master	NUCLEAR	1	2

Objectives:
The main objectives are: to provide an overall view of energy and environmental issues on a planetary scale, to identify the scientific technical, social, economic, legal and political stakes linked to sustainable management, to understand the main strategies and the driving forces for innovation in energy and water treatment technologies, to help the students to identify decision-makers and understand the role of the main actors. At the end of the course, the students will be familiarized with all aspect of environmental, risk and safety management systems and how these are evolving and being implemented by industry.

Content:
- International environmental management: methodologies of environmental audits, implementation of environmental management system (ISO14001), materials inventory and substitution, recycling, and recovery, life cycle analysis
- Energy Strategies: energy systems: technical and economic aspects – energy and nature: problem of resources and waste – energy, environment and economy – politics and geopolitics of energy: the strategies of the parties involved.
- Sustainability Management: the company, its social and natural environment – environmental economics constraints: effects on business activities – sustainable development: principles and practical implementation, eco-efficiency, industrial ecology – adaptation of environmental management systems ISO14001 and life cycle assessment ISO4040 to requirements of sustainability management. Case studies.
- Risk analysis: major qualitative and quantitative methods of risk and process safety analysis, case studies.

SSG12PI: Purchasing, e-business and Innovation

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	2

Objectives:
To be able to master the concepts, methods and tools of purchasing, e-business logistics and innovation tools and methodology applied to supply chain management.

Content:
Purchasing of goods and services for supply chain management; coordination with procurement and SC management in an externalization context / e-business strategy and SCM, concepts, methods and tools / Innovation management: methods and tools applied to product, and system development, stakes for supply chain performance.

SSG12RA: Management 2: Risk Analysis and Environment Management

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	2

Objectives:
To provide an overall view of energy and environmental issues on a planetary scale, to identify the scientific, technical, social, economic, legal and political stakes linked to sustainable management, to help the students to identify decision-makers and understand the role of the main actors. At the end of the course, the students will be familiarized with all aspect of environmental, risk and safety management systems and how these are evolving and being implemented by industry.

Content:
International Environmental Management: methodologies of environmental audits, implementation of environmental management system (ISO14001), materials inventory and substitution, recycling, and recovery, life cycle analysis Sustainability Management: the company, its social and natural environment – environmental economics constraints: effects on business activities – sustainable development: principles and practical implementation, eco-efficiency , industrial ecology – adaptation of environmental management systems ISO14001 and life cycle assessment ISO4040 to requirements of sustainability management. Case studies. Risk Analysis: major qualitative and quantitative methods of risk and process safety analysis, case studies.

SSG21EM: Energy management

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	2	1

Objectives:
To examine sustainable options for energy production, supply and consumption and to enable a critical evaluation of emerging ideas and technologies. To understand the energy recovery and management techniques of production and distribution systems. To know incentives, market opportunities and requirements for improving energy efficiency in the different sectors. To know the methods of energy audit.

Content:
Purchasing of goods and services for supply chain management; coordination with procurement and SC management in an externalization context / e-business strategy and SCM, concepts, methods and tools / Innovation management: methods and tools applied to product, and system development, stakes for supply chain performance.

SSG21NS: Nuclear: Management, Safety and Society

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	NUCLEAR	2	1

Objectives:
The objectives of these courses are to gain full understanding and sensibility for socio-economic as well as ethical issues to become a key actor at the interface between engineering solutions, individual and public values, public acceptance and decision making, to become acquainted with the institutional framework. Project management related to the nuclear field will also be taught.

Content:
- Institutional framework, actors and responsibilities: general safety objectives; justice in imposing environmental risks, consideration of social dimension of temporality, situation in France and in other countries; role of international organizations
- Socio-economic and ethical aspects: public acceptance: implication of scientific, general and local public; protest movements integration of disposal concept in the regional development; radioactive waste governance in an international perspective; intergenerational responsibilities (ethics and memory), nuclear energy in sustainable nuclear development
- Project Management

SSG21PM: Management 3

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	2	1

Objectives:

To be able to analyze collective action at work and project dynamics in link with individual logics. To be aware of the individual, collective and social stakes related to management of industrial projects. To communicate efficiently in various situations and contexts. To understand the factors affecting both good and bad team performances. In addition the course aims at helping participants to work effectively and to negotiate in intercultural settings, through a better understanding of their own cultural conditioning and awareness of the differences in management and conflict styles throughout the world.

Content:

Team work and Communication: Communication modes and appropriate selection, listening and responding skills, communication with an audience, selling and negotiation skills, team building, setting targets and support provisions, improving team efficiency and motivation, good practices, problems and conflicts resolution.
Project Management: Project Management, Project Planning, Project Scheduling, Project Cost management, Case Study.
International Negotiations: Actors and Processes, instrumental and behavioral aspects, stake, conflict, convergence & divergence, consultation, confrontation and conciliation.

SSG21ST: Supply Chain Information Systems and Technologies

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	2	1

Objectives:

To be able to understand the various types and components of Information Systems and technologies used in SCM for data management, communication and decision making.

Content:

Information Systems for SCM: design methodology and software (ERP - MES, APS…), decision support systems, geographical information systems, study of a specific ERP like SAP.
Module 1: Information systems design and software for SCM.
Module 2: Decision support systems, geographical information systems (GIS).
Module 3: Using a real ERP to model data management in a supply chain (SAP). Laboratory work.

ST: Scientific and Technique Modules

ST111IR: Physics of Ionizing Radiations

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	NUCLEAR	1	1

Objectives:

Give an overview about the master and the three options and more precisely the nuclear sciences and applications. This course constitutes the essential knowledge for nuclear engineering. This allows understanding the origin of ionizing radiations at an atomic level and their interaction with matter. Theoretical and practical aspects will be taught. The student will be capable of calculating an activity of a source or the energy deposited by a particles flux in matter.

Content:

- Nuclear physics and radioactivity course concerns the basis that describes the essential characteristics of atom and atomic nucleus. This allows understanding the radioactivity and the mechanisms of nuclear reactions and various applications.
- Interaction of radiation with matter course describes the physics processes involved in radiation/matter interaction.
- Introduction to dosimetry.

ST111PO: Production and Operation Management

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	1

Objectives:
To be able to master the concepts and methods of production, procurement and inventory management.

Content:
Production management & planning concepts and methods (planning, MrP method), procurement and inventory management goals and methods.Module 1: Production management and planning.Module 2: Procurement and Inventory Management. Module 3: SC modelling using basic tools (EXCEL, ACCESS, visual Basic)

ST111TP: Transfer Phenomena

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	1

Objectives:
To acquire fundamental knowledge and to understand the terminology and the scientific concepts used to describe mass and energy conservation, as well as transfer phenomena. This session prepares the students to access to a specialized engineering knowledge, applicable to industrial processes and energy conversion systems.

Content:
- **Fluid Mechanics:** Bernoulli's law, pipe flow, Reynolds number, forces on obstacles, Navier-Stokes equations
- **Heat Transfer:** Conduction, Convection and Radiation heat transfer
- **Mass Transfer:** Fick's law, mass diffusion, convective mass transfer with and without chemical transformation, heat-mass analogy.

ST121BR: Basics for Reactors

ECTS	Language	Degree	Program	Year	Semester
7	English	Master	NUCLEAR	2	1

Objectives:
Main goal of this UV is to give basics knowledge of reactor physics and thermohydraulics, necessary to understand the principles of reactor operations. The student will also apply the acquired theoretical knowledges to simple Monte Carlo reactor simulations with SERPENT code.

Content:
- Reactor physics basics (physics for reactors or NEPIA (30h): neutron interaction with matter, fission and radiative capture, slowing down / absorption of neutron, Neutron chain, reacting system, burn up and evolution, reactivity effects; evolution in reactors for ANWM (10h): evolution reaction and cross section, reactor inventory evolution, waste evolution, electronuclear scenario)
- Thermohydraulics for reactors (36h NEPIA): basics of thermodynamics and thermohydraulics for reactors
- Reactor simulation with SERPENT Monte Carlo Code (21h, NEPIA + ANWM): simple geometries (pin, assembly), Doppler effect, statistical errors, burn-up calculation
- Computing methods (14h, NEPIA +ANWM first 4h): basics of C programming with practical examples.

ST121EE: Thermodynamics for Energy Systems

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	2	1

Objectives:
To gain necessary knowledge about concepts, thermodynamics cycles and technologies in order to be able to design energy production and conversion systems. Application cover heat and power generation as well as refrigeration cycles.

Content:
- Steam cycle, gas turbine cycle, combined cycle for heat and power generation, nuclear power cycle, refrigeration cycle, efficiency, COP.

ST121PO: Supply Chain and Transport Planning and Optimization

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	2	1

Objectives:
To be able to analyze, modelize and solve complex novative problems of supply chain network design and transport problems.

Content:
- Supply Chain network design and optimization models and techniques, facility location: applications on new challenges (collaborative networks, closed loop/ reverse logistics, sustainable development, reactive vehicle and technician routing, maritime and port logistics…). Module 1: Supply chain network design, facility location.
- Module 2: transport planning and optimization, vehicle routing, port logistics.
- Module 3: Warehouse design.

ST121WS: Wastes conditioning and Storage

ECTS	Language	Degree	Program	Year	Semester
7	English	Master	NUCLEAR	2	1

Objectives:
The objectives of these courses are to acquire knowledge and competence to classify radioactive wastes, their properties and inventories, to propose methods to condition the waste in stable forms and packages, as well as to select industrial solutions such as surface storage.

Content:
- Inventories of nuclear waste types and classification schemes in various countries
- Waste characterization
- Waste conditioning and packages: confinement matrices and its generic properties; container for highly active waste; type and properties of the waste package gamma and high energy X-ray imaging (radiography, tomography) Elemental characterization by neutron-induced gamma rays
- Storage concepts and sites: interim storage; industrial solutions for low and intermediate level wastes; case of specific wastes (graphite waste, radium-rich wastes, tritium-rich wastes).

ST211DR: Detection of Ionizing Radiations

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	1	1

Objectives:
Give an overview about the principals of ionizing radiation detection with the definitions, properties, and application of the detectors of ionizing radiation (IR). Also the course deals with an overview of the gas detectors, scintillation detectors, detectors for high energy IR, semiconductor detectors, and integrating solid state detectors.

Content:
- Introduction lecture on the application of the principles of interaction with matter to the case of detectors.
- Set of laboratory work for radiation measurement. This is an application of student knowledge on radiation/matter interaction and help to develop analytical capacities of physics phenomena.

ST211EE: Introduction to Energy and Environmental Issues

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	1

Objectives:
To describe the international policy context of energy and environmental issues. To know the key figures, the national and international commitments and they consequences in policies and regulations. To understand the possible actions in a constraint frame.

Content:
- Energy and Environmental Policies: Key figures, History of policies, Long term and midterm objectives
- Stakeholders analysis: Multiscale analysis and decision mechanisms
- Policies/Standards/Regulations: Case studies

ST211OR: Operation research 1

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	MOST	1	1

Objectives:
To be able to develop models and practice the fundamental tools of Operations Research.

Content:
Operations research methods, models and algorithms (linear and integer programming, graphs and network flows) - theory and applications with solvers and develop optimization algorithms. Module 1: Operations research modeling and solving with software (Cplex...). Module 2: Algorithm development in a computer language (Java...).

ST212RP: Radioprotection

ECTS	Language	Degree	Program	Year	Semester
6	English	Master	NUCLEAR	1	2

Objectives:
This course constitutes the essential knowledge for radiation protection of human and environment. The students will learn about the principals of radioprotection, regulations and dosimetry. The students will then learn how to practice in the laboratory the rules of radioprotection and then use some simulation codes.

Content:
- Principals of radioprotection course concern the basis that describes the radiation protection. The rules, regulations and organization will be learned and principals of dosimetry will be taught.
- Work practices course is a series of laboratory practice to learn the use of radiation control equipment and to set up shielding for the safe use of radioactivity.
- Simulation course is a set of practice work with MicroShields code or MERCURAD which is a comprehensive neutron, gamma ray shielding and dose assessment program that is widely used for designing shields, estimating source strength from radiation measurements, minimizing exposure to people, and teaching shielding principles.

ST221DD: Dismantlement and Decommissioning of Nuclear Installations

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	NUCLEAR	2	1

Objectives:
The objectives of these courses are to acquire knowledge necessary to understand a dismantlement project, the problematic and the actors (clients, subcontractors, safety authority), and to learn the role of a dismantlement engineer. Competences in radiological inventories, confinement and nuclear ventilation techniques, and cost evaluation will be acquired.

Content:
- Generalities: definition of a dismantlement project and missions of a dismantlement engineer, dismantlement in France
- Actors: clients, subcontractors, nuclear safety authority
- Political, economical and societal implications
- Problematic: safety, radiation protection, waste management, cost.

ST221PS: Planning and Scheduling of Production and Services

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	2	1

Objectives:
To be able to model and solve complex planning and scheduling problems for production or service activities and design a simulation application.

Content:
Advanced models and algorithms of production planning and scheduling: multiple production site, uncertainties, reactive environment, personnel planning, time tabling.
Module 1: modeling and solving planning problems.
Module 2: scheduling models and algorithms and applications.
Module 3: computer simulation case studies modeling and solving with a software (Arena...)

ST221RD: Renewables

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	2	1

Objectives:
To gain necessary knowledge about alternative energy resources and their technical implementation. To understand energy conversion and storage for renewable technologies and to evaluate the limits of their potential use.

Content:
Solar Photovoltaic, Solar thermal, Wind energy, Biomass resources, geothermal, Ocean Energy.

ST311DM: Decision Making with uncertainty and Simulation

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	1

Objectives:
To be able to master the concepts and tools of decision making with uncertainties.

Content:
Industrial probabilities and statistics, forecasting methods, discrete event simulation: theory and applications with software.
Module 1: Probabilities & statistical decision making.
Module 2: Forecasting for supply chain demand planning.
Module 3: Simulation theory and applications to SC, production and transport systems.

ST311NM: Introduction to Nuclear Modeling

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	1	1

Objectives:
This course will give the basic knowledge for understanding and undertaking numerical simulations of nuclear systems. The students will learn the basic concepts of microscopic stochastic modeling and thus understand the basic philosophy of several numerical simulation tools that they will use in the later part of the curriculum. Another aspect is to get the students acquainted with the typical environment of these simulation codes and with typical computer languages used when working with simulation models. This prepares the students to be able to postulate for research projects with a strong development component.

Content:
- Introduction to Monte Carlo Methods and stochastical simulation.
- Introduction to Linux systems and shell environments.
- Introduction to the use of shell and python scripts for processing data
- Introduction to typical computer languages used by simulation codes, such like Fortran, C, C++

ST312EP: Environment and process engineering

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	2

Objectives:
To be able to understand environmental process engineering and to design solid-gas processes and define adapted industrial technologies for applications related to combustion and de-dusting.

Content:
Chemical reaction Engineering applied to environmental process (Energy & Mass Balances). Solid-gas Process Engineering: characterization of particulate solids and powders, flow through porous media, engineering and design of fluidized beds and cyclones, industrial applications.

ST312RA: Physico-chemistry of Environment

ECTS	Language	Degree	Program	Year	Semester
7	English	Master	NUCLEAR	1	2

Objectives:

This course constitutes the essential knowledge in radiochemistry and radioactivity in the environment. The student will acquire the necessary basis to understand the chemical processes in nuclear fuel cycle and the behaviour of radioactivity in the environment. Introduction to radiation control and radiobiology will also be taught. Finally, a set of laboratory work to detect radioactivity at an environmental level will be realized.

Content:

- Environment and Radioactivity course includes an introduction on the nuclear fuel cycle. Geochemical cycles of certain elements will be discussed and behaviour of natural and artificial radioactivity will be discussed in term of waste and natural radioactivity including radon. the course also includes an introduction on radiation control and radiobiology.
- Introduction to radiochemistry course includes basic environmental chemistry (acid-base, oxydo-reduction, sorption and complexation processes….). Application to the nuclear fuel cycle will also be discussed in term of reprocessing of spent fuel.
- Detectors and radiochemical analyses course is laboratory work for detection of alpha, beta and gamma rays in environmental samples with all the separation processes necessary to concentrate and measure radioactivity.

ST321ES: Energy Systems

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	2	1

Objectives:

To understand operation principles and design considerations of systems used for heat, mechanical and electrical energy generation or transformation. To know the technologies of heat engines, turbines, boilers and Internal Combustion Engines (ICE). To be able to perform calculation of thermo-physical phenomena running in the equipment. To initiate the students with modeling of complex thermodynamic cycles involved in ICE. To understand the formation of pollutants in the ICE and their controlling techniques.

Content:

- Heat Engines and Boilers: Fuels technologies, combustion, firing solutions and equipment, design and technologies of boilers, flow in nozzle, Steam and gas turbines, ChP, demonstration of basic constructions and discussion of operation terms and limits
- Design and innovation in ICE: Engine design and operation parameters, modeling real engine flow and combustion processes, spray equations and spray penetration, preparation of fuel-air mixtures, chemical thermodynamics models for combustion emissions.

ST321GD: Geological Disposal

ECTS	Language	Degree	Program	Year	Semester
7	English	Master	NUCLEAR	2	1

Objectives:

The objectives of these courses are to acquire leading edge knowledge in conceptualization of disposal of nuclear waste in deep geological formations, in the associated geology and thermohydraulics, in repository technology and the properties of a system of engineered barriers and in the phenomenology of short-and long-term evolution.

Content:

- Geology and hydraulics of potential disposal sites: concepts for geological disposal of intermediate and high level wastes; scientific and technical site selection criteria; site characterization; geology of reference sites in clay, granite salt; experience from URLs
- repository technology: development of specific techniques for drilling; development of system for closure each location of the repository; development of instrumentation for long-term monitoring; design of engineered barrier system (EBS) including materials choices and its properties
- phenomenology of evolution of disposal system: evolution of disposal system during operational and long term post closure phase; various phases in the «life cycle» of a disposal site for high level waste; evolution of engineered barrier system (EBS) and waste packages under repository multiples interaction conditions; migration from EBS to biosphere.

ST321NM: Nuclear Materials

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	2	1

Objectives:

This course presents the state-of-the-art of the various technological aspects of the design, manufacture and operation of fuel assemblies of PWR nuclear reactors. The course introduces the fuels from the main nuclear subsectors and then focuses on assemblies and to lesser degree Na-cooled fast neutrons reactors. The objective of the course is to give a global vision on the design of PWR fuel assemblies and the interrelationships between the various physical phenomena to which they are subjected.

Content:

- Description of the reactors and their fuel assemblies (A / Cs)
- Design rules for PWR assemblies
- Behavior of materials
- Thermomechanical aspects
- Mechanical aspects
- Thermo-hydraulic aspects
- Neutronic aspects
- Fuel cycle, economy and waste

ST321OP: Advanced Operations Research

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	2	1

Objectives:

To be able to master advanced optimization techniques necessary for modeling and solving complex novative problems studied in the other modules: methaheuristics, mathematical programming.

Content:

Advanced optimization techniques: Algorithmics - Meta heuristics - Maths Programming and Branch and Price methods: models, algorithms and applications related to other courses.
Module 1: models and optimization algorithms.
Module 2: Modeling and solving real optimization case studies with a solver.

ST411NP: Introduction to neutron physics

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	NUCLEAR	1	1

Objectives:

This course gives a first introduction to the physics of the interaction of neutrons with matter. At the issue of these lectures the students will be able to understand the basic equations ruling the transport of neutrons, to identify the basic ingredients for determining criticality, to solve simple cases of the diffusion equation, to calculate the Bucklings of simple geometric systems and to estimate their effective criticality coefficient.

Content:

- Cinematics of particle transport
- Introduction to criticality calculations
- One group diffusion equation
- Geometrical Bucklings and calculation of criticality constraints

ST412IW: Incineration and Waste Minimization

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	2

Objectives:

To be able to design process related to combustion, solid waste incineration, gasification, solid thermal treatment, catalytic reactions. The course stresses the necessity to take into account the economic criteria, the legal constraints, the environmental impact (control and reduction of pollution and waste generation), and the energy costs in order to define an optimal design of processes.

Content:

Incineration & Combustion Processes: conventional fuels, waste as fuel, basics of combustion and flames, combustion equipment and furnaces, thermal techniques for waste treatment, incineration and gasification, energy recovery, pollution control equipment, ash disposal facilities, planning and strategies, case studies of success and failure. Waste Minimization and Process Integration: typical causes and sources of waste, hazardous wastes, benefits and implementation of a waste management program, methodology and practical techniques to minimize waste, case studies.

ST412ME: Supply Chains performance Methods and Evaluation

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	2

Objectives:

To be able to understand and master the concepts methods and tools of performance and quality applied to supply chain, production and transport.

Content:

- **Module 1:** Management of Quality. The module provides an overview of the corresponding concepts in a historical perspective and presents the various notions of quality, including quality of service and the stakes of quality for the company performance. The ISO 9001 international quality norm is presented as well as the steps and methodology for total quality management. Case study project.
- **Module 2:** Operational Efficiency. Study and practice the methods and tools of operational efficiency for short term performance (6sigma, lean manufacturing, Just in time…)
- **Module 3:** SC Performance evaluation. Learn the concepts of SC performance evaluation and progress through the international SCOR method and referential. Apply on case studies.

ST412NT: Introduction to Nuclear Technology

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	NUCLEAR	1	2

Objectives:

The objectives of these courses are to offer an introduction to nuclear energy and technological application such as accelerators and cyclotrons. The course will also include an introduction to fuel cycle. This introductory course is meant to give insights on the options proposed in the second year of the master:
1: waste management, 2: energy production and applications, and 3: medical applications.

Content:

- **Nuclear reactors** course gives insights on the pressurized water reactors and other reactors technologies including the 4th generation. The students will learn physical and technical aspects of nuclear reactors.
- **Aspects of criticality** course treats the formulation of criticality, the aspects of slowing-down and moderation as well the dynamics of the reactor at short, intermediate and long-term timescales (delayed neutrons, Xenon, Samarium, burnup).
- **Accelerators** course concerning accelerators provides knowledge on application of accelerators including theoretical basis of linear accelerators and circular accelerators such as cyclotrons and synchrotrons. the course ends up with application of accelerators in industry and healthcare and insights on new techniques for accelerators.
- **Fuel cycle and nuclear materials** course is an introduction to the fuel cycle from the mine to recycling of spent fuel and disposal of radioactive waste. A brief introduction to nuclear materials including structure, phase diagrams, radiation effects in materials (steels, zirconium/zircaloy, oxides uO2/MOX, graphite, glass, ceramics, concrete…).

ST421EE: Energy Efficiency and Services

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	2	1

Objectives:

To be able to evaluate the energy demand and implement strategies of energy savings taking into account both societal and environmental features (transports, air and water management systems, interactions between the different stakeholders).
To acquire the methodology skills and be able to select the best technical solution from multiscale analysis of systems, including buildings, districts, cities and industrial sites.

Content:

Energy Efficiency, Energy demand and Strategies for EE, Application to residential Sector, technical and Economical analysis of energy options.

ST421OM: Operation and Maintenance

ECTS	Language	Degree	Program	Year	Semester
9	English	Master	NUCLEAR	2	1

Objectives:

This course will give the basic knowledge in Nuclear Reactor Exploitation and Maintenance. The students will acquire the main general concepts important in nuclear reactor functioning, such as reactor design, radio protection and reactor operation. These basics will be used to understand the exploitation and safety aspects of nuclear reactors through theoretical lessons and simulations on different kind of reactors.

Content:

- Fundamental course includes an introduction to reactor physics (basics of radioactivity, neutronics, criticality, reactivity management) and technical features (reactor design and main components, main reactor concepts, fuel cycle).
- The design and exploitation course will treat the main safety aspects of nuclear reactor during the different phases of exploitation: design stage, construction and Start Up, operation and maintenance
- Radio protection for nuclear reactors
- Practice on IRSN simulator in normal and accidental conditions
- Advanced Nuclear technologies: accelerators and reactors for fundamental and applied physics

ST421SA: Safety

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	NUCLEAR	2	1

Objectives:

The objectives of these courses are to acquire the keys to evaluate the migration and the transport of radionuclides by using geochemical and transport modelling, to evaluate the performance and the safety of the predictions according to the type of disposal, and finally to evaluate the radiotoxicity and the chemotoxicity of radionuclides in case of exposure.

Content:

- Geochemical and transport modelling: chemistry of actinides, fission products and activation products in the environment; principals on transport properties in geological and engineered formations; processes, model and codes in porous media
- Modelling of radionuclides transfer to human beings
- Performance and safety: general methods of risk assessment, possibility for and limitation of long term predictions; global analysis and safety analysis of the geological disposal system; performance and safety analyses of surface and subsurface disposal
- Radioprotection: radiation dose; radiotoxicity; chemotoxicity, radiobiology
- Environmental impact of nuclear installations.

ST512AS: Air and Soil Remediation

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	2

Objectives:
This course gives an overview of the main treatment processes applied in fields including air treatment, industrial gas purification and soil remediation. It combines both theoretical engineering knowledge and practical know-how (mini-project, industrial case studies).

Content:
Flue gas treatment technologies: to be able to understand, design main technologies adapted for flue gas cleaning Biological gas treatment: Odour and COv treatment using biological filters are presented in this module through a «learn by project» seminar. Soil treatment: Overview of main technologies employed to treat soils polluted by industrial activities (oil,heavy metals, chemical compounds etc.).

ST512DS: Supply Chains Design and Support

ECTS	Language	Degree	Program	Year	Semester
5	English	Master	MOST	1	2

Objectives:
Master the key concepts of product development and supply chain management along the product life cycle and learn about selected innovative topics.

Content:
Product life cycle, characteristics, methods and tools of production systems and supply chains design and management along the product life cycle, including: product and production system design (concurrent engineering), maintenance techniques in uncertain environment (integrated logistics support) and end-of-life product recycling and system dismantling (reverse logistics).

ST521EN: Energy Networks

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	2	1

Objectives:
To provide understanding of energy network issues: implementation, management, interconnection, multiscale approach, energy resources and systems compatible with networks, Networks and Energy Efficiency.

Content:
Electricity Networks, Smart grid, Smart Metering, heating & Cooling Networks.

ST612WT: Water Treatment Processes

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	2

Objectives:
This course gives an overview of the main treatment processes for drinking water and wastewater treatment. A multi-scale approach is developed including description of mechanisms, conventional models, technology presentation, system design and economic analysis. Students will gain knowledge about legislation regarding pollutant discard, and how to design and/or optimize treatment processes in order to respect pollutant emissions thresholds.

Content:
Biological Wastewater treatment: Pollutant fraction in wastewater and main microbiological processes occurring in biological wastewater treatment plant are first presented, with an emphasis on activated sludge treatment process. Industrial wastewater treatment. Drinking Water treatment: Basics of drinking water treatment processes are presented along with a background of physico-chemical involved in water treatment processes. Stormwater management and treatment.

ST621EM: Energy Modelling and Optmization

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	2	1

Objectives:
To be able to use relevant tools and model for energy engineering, depending the scale studied (system, process, industrial plant, region, country…) in view of proposing the most efficient energy systems mix

Content:
To understand the main strategies and the driving forces for innovation in water management and water treatment technologies. To help the students to identify decision-makers and understand the role of the main actors. to understand new avenues for drinking and wastewater management (industrial, domestic, stormwater) with a multi-scale approach.

ST712WS: Water Strategies and Innovation

ECTS	Language	Degree	Program	Year	Semester
3	English	Master	PM3E	1	2

Objectives:
To understand the main strategies and the driving forces for innovation in water management and water treatment technologies. To help the students to identify decision-makers and understand the role of the main actors. to understand new avenues for drinking and wastewater management (industrial, domestic, stormwater) with a multi-scale approach.

Content:
Water Strategies: use and treatment of water over the course of human history, the interrelationship between the water environment and public health, and the prospects for advanced treatment. PPCPs in the environment measure and treatment: definition of Pharmaceuticals and Personal Care Products as Pollutants (PPCPs), how to measure PPCPs in Environment (water, soils) and how it affects ecosystems and health. Innovation in water for the future: Ecological sanitation and decentralized extensive wastewater management. Membrane processes as a solution for desalinization and water treatment.

ST812PM: Process Modelling, Simulation and Control

ECTS	Language	Degree	Program	Year	Semester
4	English	Master	PM3E	1	2

Objectives:
Based on solids knowledge gained in process engineering (St312EP, St412IW & St512AS), this course aims at giving students the ability to use the most widespread software-tools dedicated to process modeling and control. Basic skills on how to obtain and compile data from static and dynamic systems will be provided using linear methods. the main objective is to enable students to reduce environmental impact and energy consumption of new or existing environmental processes trough both modeling, simulation and control approaches.

Content:
An introduction to the field of process modeling is first given by highlighting differences between mechanistic and empirical approaches dynamic and static modeling.
The course includes four different modules (only two are mandatory).
1) process control, MAtLAB for linear system, and SIMuLINK for dynamic process control.
2) process modeling & design, with practices on two softwares: ASPEN+ for static air, waste and Energy system modeling and optimization, and BIOWin for wastewater treatment processes
3) modeling of pollutant dispersion in the surroundings environment
4) modeling of membranes processes for water treatment

All the following modules starting by X

	Language	Degree	Program	Year	Semester
	French	Master	Nuclear Medical Applications	2	1

X9PA010: Nuclear reactions and Radiations

Objectives:
This course presents the physics involved in nuclear reactions and radiation interaction with matter and describes the different techniques of radiation production and detection.

Content:
- Nuclear Reactions
- Accelerators and Particle Beams
- Radiation Interaction in Matter
- Detection

X9PA020: Mathematical Tools and Computer Simulation

■ Objectives:

This course presents the mathematical tools used for data analysis and image processing, and the basics on Monte Carlo simulations. These tools are further used in a computing project.

■ Content:

- Mathematical Tools for Data Analysis and Image Processing
- Monte Carlo Simulation Technique
- Computing Project

X9PA040: Effects of Ionizing Radiation

■ Objectives:

This course presents the biological (radiobiology) and chemical (radiolysis) effects of radiation.

■ Content:

- Radiobiology
- Radiolysis

X9PA050: Applications, Quality and Project Management

■ Objectives:

This course presents various industrial applications and management tools (quality, projetct management) related to the use of ionizing radiations.

■ Content:

- Industrial Applications
- Quality Approach
- Project Management

X9PA110: Basics of Medical Physics and Imaging

■ Objectives:

This course presents the basics of medical physics and imaging.

■ Content:

- Introduction to Medical Physics
- Introduction to Medical Imaging (including MRI and Ultrasound)
- Radiopharmaceutical and Clinical Applications

X9PA120: Medical Imaging Techniques

■ Objectives:

This course presents the medical imaging techniques, image analysis and associated simulation.

■ Content:

- Radiology
- Nuclear Medicine
- Image Processing
- GATE Simulation

X9PA130: Dosimetry

■ Objectives:

This course presents fundamentals on dosimetry and protocols and calculation algorithms used in radiotherapy and nuclear medicine.

■ Content:

- Fundamentals on Dosimetry
- Dosimetry Protocols
- Calculation Algorithms
- Dosimetry in Radiology, Brachytherapy and Nuclear Medicine

FRENCH SUMMER SCHOOL

AT THE ActiFLE CENTRE – IMT ATLANTIQUE, NANTES CAMPUS

Prepare for successful studies in France by coming to our campus at ActiFLE Centre.
During July and August before your academic career begins.
Spend two weeks enjoying life with a French family!

TUITION FEES

■ **Intake in July for 8 weeks:**
- 2060 Euro
- For students registered in a partner institution 1610 Euro

■ **Intake in July for 6 weeks:**
- 1610 Euro
- For students registered in a partner institution 1260 Euro

■ **Intake in August for 4 weeks:**
- 1070 Euro
- For students registered in a partner institution 870 Euro
(Accommodation, meals, transportation are not included)

■ **Website imt atlantique:** www.imt-atlantique.fr/fss
■ **Contact:** frenchsummerschool-nantes@imt-atlantique.fr
■ **Online application:** https://fss.imt-atlantique.fr

FRENCH SUMMER SCHOOL

WELCOME
AT THE ActiFLE CENTRE!

We provide excellent teaching to meet your personal learning objectives but we look after you even when you leave the classroom. We take care of your welfare, provide you with support and advice, organise social activities so you can meet other students, practise your new language skills and begin to understand what life is like in France! The French Summer School gives you the chance to settle into the French academic environment.

■ PROGRAMME

Your teachers are both experienced and qualified in teaching French as a foreign language, and they know how difficult it is to learn a foreign language because they have lived abroad themselves!
They provide quality teaching in small classes of 12 students to ensure a high level of individual attention.

When you arrive, you will be assessed to determine your language and communication level. Your progress is monitored throughout the course and you will be assessed regularly.
At the end of the course, you will receive :

- a Progress report detailing your level and the progress you have made
- an official diploma, the tEF, organised by the CCIP, Chambre de Commerce et d'Industrie de Paris, recognised all over the world.
- your transcript

You will have a personal programme with regular tutorials to personalise your course, and the chance to change language level group according to your progress throughout the session.
You will discover how to study at graduate level in France: codes of behaviour, specialised vocabulary, techniques, expectations from your professors, how to be a perfect French student!
The teaching team works with social activity organisers all dedicated to the French Summer School, living on the Campus. After class and at weekends they set up activities to help you to practise the language you have learned.

■ STUDY FACILITIES

You will be working in the Language Centre at IMT Atlantique, Nantes campus:

- pleasant classrooms equipped with a variety of study aids, and with wifi access
- a range of specialised magazines for learning French, reference materials, books and newspapers
- simplified readers, specially written for language learners, at five different levels
- practice materials for French language examinations
- an audio laboratory for practising pronunciation or listening to recorded conversations, interviews, stories and lectures

■ STUDY FACILITIES

There are 30 hours of French language and culture each week, including 25 hours with a dedicated teacher, as well as tuition, directed individual or group learning. Each week a different theme is developed to introduce you to French life and to progress your language knowledge from beginner to advanced.

The course includes:

- Language development and grammar work in context
- Speaking and pronunciation practice, including oral presentation skills
- Intensive and extensive listening and reading skills
- Academic writing skills suchas note-taking, summaries…
- Short presentations given by scientific researchers to improve understanding
- Creative workshops to meet your colleagues from different cultures, to work and have fun together
- Language activities to prepare for engineering studies

Classes are based on the range of language skills identified at different levels in the Common European Framework from the Council of Europe, from A1 to C1.

VISITS AND ACTIVITIES

Each week, visits and excursions are arranged according to the special theme of the week. These visits form an integral part of the language learning experience with preparation in class so that students make the most of the activity.

The visits can include:

- Cultural outings (City Art gallery, summer festivals, street surveys)
- Industry (waste recycling centre, oyster farms, wine production)
- French gastronomy (cheese dairy, ice cream producer, typical city market)
- Historical sites (Chateau des ducs, the history of Nantes walking tour)

Other excursions and activities are arranged with the social activity organisers for evenings and weekends: festivals, concerts in town, street theatre, visits to the seaside as well as international meals and sports competitions or karaoke! These visits offer students the chance to practise what they have learned in class, to understand everyday life in France, to become independent and to enjoy themselves.

ACCOMMODATION AND CAMPUS

Students live on campus in individual study bedrooms or in a double room for couples with cooking facilities and private bathrooms. There are excellent sports facilities including an indoor sports hall and tennis courts. There is access to IMT Atlantique restaurant for lunch every weekday.

You can also choose to live in a French family to test and taste French life from 2 to 8 weeks: the families are selected for their enthusiasm and their proximity to IMT Atlantique, Nantes campus.

FRENCH GROUPS ARE FORMED AT THESE LEVELS – YOU CAN CHANGE GROUP AS YOU PROGRESS:

A1 Beginner
you have a basic knowledge of French, some everyday expressions and simple phrases

A2 Elementary
you can use simple grammar and vocabulary to talk in daily situations with a limited range of French

B1 Intermediate
you can understand a simple lecture in your subject, take dictated notes and you can give your opinion

B2 Upper Intermediate
you can give a clear presentation on your subject, read long texts and talk about a range of topics

C1 Proficient
you can understand a lecture and take notes at the same time. you can write a clear essay and talk with some fluency

C2 Advanced
you can use a full range of French, at a level near to your native language

And when you get some time, you can discover Nantes, the City of Jules Verne, the 6th biggest city of France, the Atlantic coast or just go anywhere. You'll be in Paris in two hours!

IMT Atlantique
Bretagne-Pays de la Loire
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