Master 2 M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)

Année universitaire

Information générale

Objectifs	This program aims to train structural reliability, monitoring and maintenance specialists in the field of Marine Renewable Energy (MRE). At the end of this program, students will be able to use and quantify the added value of non-destructive testing techniques and SHM methods applied to offshore structures.
Responsable(s)	SCHOEFS FRANCK CHEVREUIL PLESSIS MATHILDE
Mention(s) incluant ce parcours	master Mécanique
Lieu d'enseignement	The majority of the first semester courses are held on the campus of the Faculty of Sciences of Université de Nantes. These courses are complemented by e-learning courses delivered by partner universities. The second semester can be held at the University of Nantes or in one of the partner universities (attachment). Courses can be taught at ENSM. Shared modules with the Ecole Centrale de Nantes can be offered on its campus, 2 km away.
Langues / mobilité internationale	The programme is taught in English. In the case of this Master, students will be able to carry out internships or projects abroad, and especially in partner universities.
Stage / alternance	In the first semester of the Master 2 there is a group project that lasts about two months. It is a tutored project realized within the University. The internship or project (in the second semester) lasts at least 4 months and maximum 6, in accordance with European rules. In accordance with French law, internships are therefore paid.
Poursuite d'études /débouchés	Sectors: • Energy sector, Marine and Renewable Energy, electricity, gas, oil, nuclear • Higher education and research Occupations: · Higher education and academic research · Research and Development functions · Project Manager · Structural Health Monitoring (SHM) specialists · Researcher (after a PhD)
Autres renseignements	This course is one of those offered by the Master of Mechanics, co-accredited by the Faculty of Sciences of Université de Nantes and Centrale Nantes
Conditions d'obtention de l'année	Graduation is subject to European rules (average over the year, compensation between the EU, except that there is no compensation between semesters, that is to say that the average (10/20) is required in both S1 and S2.

Programme

1er SEMESTRE	Code	ECTS	CM	CM (P)	CM (DS)	CM (DA)	CI	CI (P)	CI (DS)	CI (DA)	TD	TD (P)	TD (DS)	TD (DA)	TP	TP (P)	TP (DS)	TP (DA)	Distanciel	Total
Groupe d'UE : Core teaching units (30 ECTS)																				
Monitoring strategy and monitoring system	XMS3PU800	3	0	0	0	0	32	0	32	0	0	0	0	0	0	0	0	0	0	32
Metamodeling	XMS3PU810	3	16	16	0	0	0	0	0	0	16	16	0	0	0	0	0	0	0	32
MRE structures : wind and ocean energy	XMS3PU820	2	0	0	0	0	18	0	18	0	0	0	0	0	0	0	0	0	0	18
Risk based inspection and value of information	XMS3PU830	3	0	0	0	0	33	0	33	0	0	0	0	0	0	0	0	0	0	33
Risk and reliability in Engineering	XMS3PU840	5	8	0	8	0	44	0	44	0	8	0	8	0	0	0	0	0	0	60
Risk and reliability in Engineering : structural reliability	XMS3PE841		0	0	0	0	44	0	44	0	0	0	0	0	0	0	0	0	0	44
Risk and reliability in engineering: system reliability and time dependent reliability	XMS3PE732		8	0	8	0	0	0	0	0	8	0	8	0	0	0	0	0	0	16
Design of offshore structures	XMS3PU850	4	0	0	0	0	34	0	0	34	0	0	0	0	0	0	0	0	0	34
Technical Communication	XMS3PU860	2	0	0	0	0	20	0	0	20	0	0	0	0	0	0	0	0	0	20
Problem Based Learning and Project Management	XMS3PU870	2	0	0	0	0	29	0	29	0	0	0	0	0	0	0	0	0	0	29
Windloads on structures	XMS3PU880	3	0	0	0	0	25	0	0	25	0	0	0	0	0	0	0	0	0	25
Stochastic theory of Sealoads	XMS3PU890	3	0	0	0	0	34	0	0	34	0	0	0	0	0	0	0	0	0	34
Groupe d'UE : Teaching units witout credits (0 ECTS)																				
Préparation au toeic	XMS3AU000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FLE (French as a Foreign Language)	XMS3PU900	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fluid Dynamics	XMS1PU640	0	20	0	0	0	0	0	0	0	16	0	0	0	12	0	0	0	0	48
	Total	30																	0.00	**365.00**

2ème SEMESTRE	Code	ECTS	CM	CM (P)	CM (DS)	CM (DA)	CI	CI (P)	CI (DS)	CI (DA)	TD	TD (P)	TD (DS)	TD (DA)	TP	TP (P)	TP (DS)	TP (DA)	Distanciel	Total
Groupe d'UE : Units for professional experience (30 ECTS)																				
Internship or project and workshops	XMS4PU800	30	0	0	0	0	23	0	23	0	0	0	0	0	0	0	0	0	0	23
	Total	30																	0.00	**23.00**

Modalités d’évaluation

Mention Master 2ème année Parcours : M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL) Année universitaire

Responsable(s) : SCHOEFS FRANCK, CHEVREUIL PLESSIS MATHILDE

REGIME ORDINAIRE

					PREMIERE SESSION							DEUXIEME SESSION							TOTAL	
					Contrôle continu			Examen				Contrôle continu			Examen					
	CODE UE	INTITULE	UE non dipl.		écrit	prat.	oral	écrit	prat.	oral	durée	ecrit	prat.	oral	écrit	prat.	oral	durée	Coeff.	ECTS
Groupe d'UE : Core teaching units																				
3	XMS3PU800	Monitoring strategy and monitoring system	N	obligatoire	1	1	1					0.5	1				1.5		3	3
3	XMS3PU810	Metamodeling	N	obligatoire		50	50						30				70		3	3
3	XMS3PU820	MRE structures : wind and ocean energy	N	obligatoire	2							0.5			1.5				2	2
3	XMS3PU830	Risk based inspection and value of information	N	obligatoire		2	1						2				1		3	3
3	XMS3PU840	Risk and reliability in Engineering	N	obligatoire																5
3	XMS3PE841	Risk and reliability in Engineering : structural reliability																	0	
	XMS3PE732	Risk and reliability in engineering: system reliability and time dependent reliability																	0	
3	XMS3PU850	Design of offshore structures	N	obligatoire		4							2				2		4	4
3	XMS3PU860	Technical Communication	N	obligatoire	0.4		1.6					0.4					1.6		2	2
3	XMS3PU870	Problem Based Learning and Project Management	N	obligatoire	1		1					1					1		2	2
3	XMS3PU880	Windloads on structures	N	obligatoire	1.5		1.5					1.5					1.5		3	3
3	XMS3PU890	Stochastic theory of Sealoads	N	obligatoire	3							1			2				3	3
Groupe d'UE : Teaching units witout credits																				
3	XMS3AU000	Préparation au toeic	O	optionnelle															0	0
3	XMS3PU900	FLE (French as a Foreign Language)	O	optionnelle															0	0
1	XMS1PU640	Fluid Dynamics	O	optionnelle															0	0
Groupe d'UE : Units for professional experience																				
4	XMS4PU800	Internship or project and workshops	N	obligatoire	10	10	10								10	10	10		30	30
																		TOTAL	52	60

A la seconde session, les notes de contrôle continu correspondent à un report des notes de CC de la première session.

DISPENSE D'ASSIDUITE

					PREMIERE SESSION							DEUXIEME SESSION							TOTAL	
					Contrôle continu			Examen				Contrôle continu			Examen					
	CODE UE	**INTITULE**	**UE non dipl.**		écrit	prat.	oral	écrit	prat.	oral	durée	ecrit	prat.	oral	écrit	prat.	oral	durée	**Coeff.**	**ECTS**
Groupe d'UE : Core teaching units																				
3	XMS3PU800	Monitoring strategy and monitoring system	N	obligatoire				1.5		1.5					1.5		1.5		3	3
3	XMS3PU810	Metamodeling	N	obligatoire		50	50										100		3	3
3	XMS3PU820	MRE structures : wind and ocean energy	N	obligatoire				2							2				2	2
3	XMS3PU830	Risk based inspection and value of information	N	obligatoire					2	1						2	1		3	3
3	XMS3PU840	Risk and reliability in Engineering	N	obligatoire																5
3	XMS3PE841	Risk and reliability in Engineering : structural reliability																	0	
	XMS3PE732	Risk and reliability in engineering: system reliability and time dependent reliability																	0	
3	XMS3PU850	Design of offshore structures	N	obligatoire					4							4			4	4
3	XMS3PU860	Technical Communication	N	obligatoire				0.4		1.6					0.4		1.6		2	2
3	XMS3PU870	Problem Based Learning and Project Management	N	obligatoire				1		1					1		1		2	2
3	XMS3PU880	Windloads on structures	N	obligatoire				1.5		1.5					1.5		1.5		3	3
3	XMS3PU890	Stochastic theory of Sealoads	N	obligatoire				3							3				3	3
Groupe d'UE : Teaching units witout credits																				
3	XMS3AU000	Préparation au toeic	O	optionnelle															0	0
3	XMS3PU900	FLE (French as a Foreign Language)	O	optionnelle															0	0
1	XMS1PU640	Fluid Dynamics	O	optionnelle															0	0
Groupe d'UE : Units for professional experience																				
4	XMS4PU800	Internship or project and workshops	N	obligatoire				10	10	10					10	10	10		30	30
																		TOTAL	52	60

A la seconde session, les notes de contrôle continu correspondent à un report des notes de CC de la première session.

Description des UE

XMS3PU800	Monitoring strategy and monitoring system
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	LUPI CYRIL LEDUC DOMINIQUE LECIEUX YANN
Volume horaire total	**TOTAL :** 32h Répartition : **CM :** 0h **TD :** 0h **CI :** 32h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Monitoring strategy and monitoring system **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of the teaching unit, the student is able to: • Describe the major families of sensors, their uses and the means of acquisition available. • Prescribe the performance of measurement, transmission and storage systems according to a specific use • Describe the simple physical principles of large families of sensors
Contenu	• Introduction: from measured physics to mechanical size • Sensor technologies and acquisition devices available • Qualification and quantification of the performance of measurement systems: sensitivity, reliability, lifetime • Case of optical fibers • Case of resistivity and impedance • Selection strategy, positioning, redundancy according to use (alert / update) • Optimization of sensor positioning • Transmission, spécifications, storage and management of databases • Application to the PBL (Problem Based learning) of the industrial project semester 4
Méthodes d'enseignement	On campus
Langue d'enseignement	Anglais
Bibliographie	

XMS3PU810	Metamodeling
Lieu d'enseignement	
Niveau	Master
Semestre	3
Responsable de l'UE	
Volume horaire total	**TOTAL :** 32h Répartition : **CM :** 16h **TD :** 16h **CI :** 0h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)

Evaluation	
Pondération pour chaque matière	Metamodeling **%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of the course the students will be able to: • classify supervised or unsupervised learning methods, • describe and select model classes, • construct a model approximation based on observed data, • validate the approximation, • use the model approximation as a surrogate model (also known as metamodel).
Contenu	This course is an introduction to machine learning: the role of surrogate modeling in engineering design optimization, inverse problems or uncertainty quantification is presented and the basic concepts for its construction based on observations are introduced. The lectures will cover the following: • Design of experiment • Classical parametrized model classes: neural networks, polynomial chaos, gaussian process, support vector machine, reduced order models • Learning methods • Validation metrics and techniques for error estimation Tutorial and homework sessions will allow the students to practice and construct metamodels on benchmarks or data bases.
Méthodes d'enseignement	Tutorial and homework sessions
Langue d'enseignement	Français
Bibliographie	• The elements of Statistical learning, H. Friedman, R. Tibshirani and T. Hastie, Springer, 2009 • Model Reduction and Approximation: Theory and Algorithms, P. Benner, A. Cohen, M. Ohlberger and K Willcox, SIAM, 2017 • Neural networks and deep leaning, M. A. Nielson, 2015

XMS3PU820	**MRE structures : wind and ocean energy**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	SCHOEFS FRANCK
Volume horaire total	**TOTAL :** 18h Répartition : **CM :** 0h **TD :** 0h **CI :** 18h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	MRE structures : wind and ocean energy **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of the teaching unit, the student is able to: • Define and understand the diversity of offshore technologies • Briefly describe the relationship between technological maturity and the severity of environmental conditions in case studies.

Contenu	• MREs which resource for which technology: Site conditions in the world and in particular in France conditioning the selection of technological concepts (2h) • Approach of the offshore oil sector and its specificities according to the sites (1h) - Structures laid (1h) - Floating structures (1h) • The specific challenge of MREs and major families of solutions for: - Offshore wind power (2h) - Floating offshore wind (3h) - tidal stream (2h) - the wave energy (1h) * the thermal energy of the seas (1h)
Méthodes d'enseignement	On campus then 30% by e-learningl on offshore technology (UN-e-SEA Master TP2M database). E- Learning : As part of the Problem based Learning, a specific study will be proposed in connection with the industrial project.
Langue d'enseignement	Anglais
Bibliographie	Websites EWEA / WEAMEC

XMS3PU830	**Risk based inspection and value of information**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	SCHOEFS FRANCK SORENSEN John
Volume horaire total	**TOTAL :** 33h Répartition : **CM :** 0h **TD :** 0h **CI :** 33h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Risk based inspection and value of information **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of the teaching unit, the student is able to: • Mathematically formulate the cost function of a Risk Based Inspection Problem • Write constraint optimization problem from inspections or monitoring • Digitally implement and calculate the added value of a monitoring system on a component of an EMR system.
Contenu	
Méthodes d'enseignement	On campus and e-learning Lectures, supplemented with project work
Langue d'enseignement	Anglais
Bibliographie	

XMS3PU840	**Risk and reliability in Engineering**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3

Responsable de l'UE	SCHOEFS FRANCK SORENSEN John
Volume horaire total	**TOTAL :** 60h Répartition : **CM :** 8h **TD :** 8h **CI :** 44h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Risk and reliability in Engineering : structural reliability **0%** Risk and reliability in engineering: system reliability and time dependent reliability **0%**
Obtention de l'UE	
Programme	
Liste des matières	- Risk and reliability in Engineering : structural reliability (XMS3PE841) - Risk and reliability in engineering: system reliability and time dependent reliability (XMS3PE732)

XMS3PE841	**Risk and reliability in Engineering : structural reliability**
Langue d'enseignement	Anglais
Lieu d'enseignement	Université de Nantes
Responsable de la matière	
Volume horaire total	**TOTAL :** 44h Répartition : **CM :** 0h **TD :** 0h **CI :** 44h **TP :** 0h **EAD :** 0h
Objectifs (résultats d'apprentissage)	**Objectives** Students who complete the module: **Knowledges** • Understand the concepts risk, uncertainty, reliability and safety. • Know statistical methods for modeling physical, model, statistical and measurement uncertainties. • Know methods for assessment of reliability of structural systems using probabilistic methods. • Know methods for systems reliability for non-structural components and its applications in engineering. **Skills** • Be able to model physical, statistical, model and measurement uncertainties. • Be able to use failure rates and hazard functions to model failures in systems reliability for non-structural components. • Be able to model uncertainties for loads and strengths. • Be able to estimate the reliability by FORM/SORM methods (reliability index method) and by simulation. • Be able to model system behavior and estimate the reliability of series and parallel systems. • Understand basic concepts of stochastic processes and time-variant reliability methods. • Be able to estimate characteristic and design values for strength parameters and load bearing capacities, and for environmental loads and load effects using test data and measurements. • Be able to calibrate partial safety factors and load combination factors. • Be able to apply Bayesian statistical methods. • Be able to apply risk and reliability methods for probabilistic design of engineering structures such as buildings, bridges, offshore structures, costal structures, wind turbines etc. • Use correct professional terminology. **Competencies** • Be able to participate in a dialog on modelling of uncertainties, risk analysis and assessment of reliability of structural and non-structural components and systems. • Be able to model, calculate and communicate risk analysis, modelling of uncertainties and assessment of reliabilities for engineering problems.

Contenu	Marine structures are subjected to environmental loading. The later is fundamentaly hard to predict and has an inherent uncertainty. It has been shown progressively since the 1980's that reliability methods develop the most efficient tools in view to design offshore structures by modelling uncertainties (environment as said previously or material, soil) through the probability theory. That allows to compute or estimate a probability of failure. A failure leads to consequences of various level depending on the industrial field and the sensitivity of environment: for instance failure of an oil and gaz platform leads to economical costs but also to environmental consequences depending on the distance to shore. To deal both with the failure and its consequence in presence of uncertainties, concept of risk has been progressively used. It is fundamental for owners, operators or administrations that need to analyze rationally these very complex issues. This course provide knowledge about the following topics - Understand of the concepts risk, uncertainty, reliability and safety; Know statistical methods for modeling physical, model, statistical and measurement uncertainties; Know methods for assessment of reliability of structural systems using probabilistic methods; - in view to reach two key competencies: Be able to participate in a dialog on modelling of uncertainties, risk analysis and assessment of reliability of structural and non-structural components ; Be able to model, calculate and communicate risk analysis, modelling of uncertainties and assessment of reliabilities for engineering problems. · Introduction and Uncertainty modelling · Uncertainty modelling · Reliability of components · Structural reliability 1 · Structural reliability 2: reliability of components · Launching of mini-project · Partial Safety Factors · Time Dependant Reliability · Load combination problems · Risk analysis · Examples
Méthodes d’enseignement	On campus and e-learning Lectures, etc. supplemented with project work, workshops, presentation seminars, lab tests
Bibliographie	COST TU1402 guidelines

XMS3PE732	**Risk and reliability in engineering: system reliability and time dependent reliability**
Langue d’enseignement	Anglais
Lieu d’enseignement	
Responsable de la matière	SCHOEFS FRANCK
Volume horaire total	**TOTAL :** 16h Répartition : **CM :** 8h **TD :** 8h **CI :** 0h **TP :** 0h **EAD :** 0h
Objectifs (résultats d'apprentissage)	
Contenu	Probability theory allows to compute or estimate a probability of failure. A failure leads to consequences of various level depending on the industrial field and the sensitivity of environment. To deal both with the failure and its consequence in presence of uncertainties, concept of risk has been progressively used. It is fundamental for owners, operators or administrations that need to analyze rationally these very complex issues. This course provide knowledge about the following topics: • know methods for systems reliability for non-structural components and its applications in engineering, • know methods for time dependent reliability, in view to reach two key competencies: Be able to participate in a dialog on modelling of uncertainties, risk analysis and assessment of reliability of structural and non-structural components and systems; Be able to model, calculate and communicate risk analysis, modelling of uncertainties and assessment of reliabilities for engineering problems. Content: • System reliability 1: reliability of components • Launching of mini-project • System reliability 2: reliability of components • Partial Safety Factors • Time Dependant Reliability
Méthodes d’enseignement	e-learning Lectures, etc. supplemented with project work

Bibliographie	COST TU1402 guidelines

XMS3PU850	**Design of offshore structures**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	SCHOEFS FRANCK AMDAHL Jorgen ZHEN Gao
Volume horaire total	**TOTAL :** 34h Répartition : **CM :** 0h **TD :** 0h **CI :** 34h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Design of offshore structures **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	Provide the candidate with the knowledge and skills to carry out basic tasks regarding structural design and dimensioning of marine structures.
Contenu	• The extent of the various subjects lectured may vary from one year to the other, but will typically comprise: • Serviceability and safety design criteria, including requirements to overall stability and strength as well as evacuation and escape. • Design rules for offshore structures including offshore wind turbines. • Overview of functional, environmental and accidental loads for marine structures, with emphasis on wind - and wave induced loads. • Methods for calculating characteristic natural loads with emphasis on use of statistical methods. • Stochastic response analysis, long term response analysis, environmental contour method. • Nonlinear, time domain simulation of offshore structures and wind turbines subjected to extreme environmental actions. • Limit state design checks. • Structural resistance against accidental actions-; fires, explosions, ship collision. • Materials for marine structures. • Alternative designs of facilities for the offshore oil and gas industry.
Méthodes d'enseignement	On campus and e-learning Lectures, tutorials, projects
Langue d'enseignement	Anglais
Bibliographie	

XMS3PU860	**Technical Communication**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	BROPHY Barry
Volume horaire total	**TOTAL :** 20h Répartition : **CM :** 0h **TD :** 0h **CI :** 20h **TP :** 0h **EAD :** 0h
Place de l'enseignement	

UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Technical Communication **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	On successful completion of this module students will be able to: • Adapt your personal conversational style to the task of presenting. • Analyse your presentation task and set realistic goals. • Learn design principles of effective visual aids. • Use of communication tools – examples, analogies, stories, demo's.
Contenu	• This module focuses on making presentations. To do this an understanding of the entire communication chain is required (eg. handouts, questions, follow-up meetings etc.) It works off the assumption that you already have the skills necessary to make a presentation – your conversational skills. • The challenge is to set out your material in an audience-friendly so that you can deliver it with the same style, and as easily, as if you were talking to a friend.
Méthodes d'enseignement	The module will include: • Extensive set of videos demonstrating best practice and conversational techniques. • Themed podcasts edited from interviews with people who present as part of their jobs. • Small-group work for preparing for each presentation task. Discussion boards and several scheduled live group/class discussions. • Two sessions, one online and one at the Université de Nantes campus, during the term to deliver group presentations (assessment) • Online feedback sessions on presentations.
Langue d'enseignement	Anglais
Bibliographie	

XMS3PU870	**Problem Based Learning and Project Management**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	SCHOEFS FRANCK SORENSEN John GUERRA Aida PAKRASHI Vikram LEIRA Bernt
Volume horaire total	**TOTAL :** 29h Répartition : **CM :** 0h **TD :** 0h **CI :** 29h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Problem Based Learning and Project Management **100%**
Obtention de l'UE	
Programme	

Objectifs (résultats d'apprentissage)	Enter the learning environment by problem and manage study projects in close collaboration with peers (introduction) : • Describe and discuss the Aalborg PBL model based on the three key words: group work, Project work, problem orientation. • Identify an initial individual challenge when using a PBL approach. • Develop and practice peer feedback skills. • Practice collaborative learning in a group. • Design an action plan to deal with an initial individual challenge or curiosity. • Practice presentation skills. • Practice critical skills by giving feedback to peers. • Reflect on one's own and peers' competencies in relation to the practice exam PBL • Solves in a group a research or industrial problem in Mechanics. • Prepares for the internship in a company. • Write a report. • Present his work orally.
Contenu	
Méthodes d’enseignement	On campus and e-learning Workshops focused on the individual student working with a challenge or individual focus on the PBL approach. Peer learning is also a feature, as students discuss and reflect on their individual challenges / interests in a peer learning group. Tutored group project
Langue d’enseignement	Anglais
Bibliographie	

XMS3PU880	**Windloads on structures**
Lieu d’enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l’UE	SORENSEN John
Volume horaire total	**TOTAL :** 25h Répartition : **CM :** 0h **TD :** 0h **CI :** 25h **TP :** 0h **EAD :** 0h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Windloads on structures **100%**
Obtention de l’UE	
Programme	
Objectifs (résultats d'apprentissage)	Knowledge • Understand the nature of wind: wind profile, mean wind, extreme wind, turbulence, turbulence field – for applications for structures such as buildings, bridges and wind turbines. • Understand modelling and calculation of wind loads on civil engineering structures • Be able to calculate static and dynamic wind loads on buildings. • Be able to assess cross-wind load actions such as rhythmic vortex shedding and galloping. • Be able to assess structures exposed to wind load in ULS and SLS (comfort). • Be able to apply rules for wind actions in design codes. • Use correct professional terminology. Competencies • Be able to model, calculate and communicate wind loads on civil engineering structures.
Contenu	Introduction to wind loads on structures/ Static wind loads/ Dynamic wind loads (along wind)/ Dynamic wind loads (across wind)/ Windloads on complex structures
Méthodes d’enseignement	e-learning Lectures, etc. supplemented with project work, workshops, presentation seminars, lab tests

Langue d’enseignement	Anglais
Bibliographie	

XMS3PU890	**Stochastic theory of Sealoads**
Lieu d’enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l’UE	LEIRA Bernt
Volume horaire total	**TOTAL :** 34h Répartition : **CM :** 0h **TD :** 0h **CI :** 34h **TP :** 0h **EAD :** 0h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Stochastic theory of Sealoads **100%**
Obtention de l’UE	
Programme	
Objectifs (résultats d'apprentissage)	• To have detailed knowledge of statistical methods and of the basis for description of stochastic processes. This includes detailed knowledge of the topics given in the academic content. • To be able to make simple calculations of stochastic loads on and responses of marine structures. • To master the concepts and terminology which are used in statistical methods and in the description of stochastic processes and how this is applied in marine technology. • To have detailed knowledge of the basic principles and methods which are used to describe stochastic processes with the emphasis on the applications to sealoads and motions of marine systems.
Contenu	• Transformation of random variables. • Monte Carlo simulation. • Probability distributions for response. • Parameter-estimation. • Extreme-value statistics. • Stochastic processes. • Auto- and cross-correlation functions. Spectra and cross-spectra. • Differentiation of stochastic processes. • Excitation-response of stochastic processes. Response-statistics.
Méthodes d’enseignement	E-learning Virtual classes/videos, online exercices
Langue d’enseignement	Anglais
Bibliographie	D.E. Newland: An introduction to random vibrations, spectral and wavelet analysis, 3rd edition, 1993. D. Myrhaug: Lecture notes. B. Leira: Lecture notes.

XMS3AU000	**Préparation au toeic**
Lieu d’enseignement	FST-Lombarderie
Niveau	Master
Semestre	3
Responsable de l’UE	KERVISION SYLVIE
Volume horaire total	**TOTAL :** 0h Répartition : **CM :** 0h **TD :** 0h **CI :** 0h **TP :** 0h **EAD :** 0h

Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Chimie Moléculaire et Thérapeutique (CMT),M2 Capteurs Intelligents et Qualité des Systèmes Electroniques,M2 Rayonnements Ionisants et Applications médicales (RIA),M2 Démantèlement et Modélisation Nucléaires (DMN),M2 Recherche en Physique Subatomique (RPS),M2 Sciences de la Matière - Parcours Energies Nouvelles et Renouvelables (ENR) - option Gestion de l'énergie,M2 Sciences de la Matière - Parcours Energies Nouvelles et Renouvelables (ENR) - option Dispositifs pour l'énergie,M2 Conception et Réalisation des Bâtiments,M2 Travaux Publics et Maintenance,M2 Travaux Publics et Maritimes,M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL),M2 Mécanique et Fiabilité des Structures (MFS),M2 Sciences, techniques et médecine aux époques moderne et contemporaine,M2 Technologie Marine - Parcours International Travaux Publics et Maritimes,M2 CMI-INA,M2 CMI-ICM
Evaluation	
Pondération pour chaque matière	Préparation au TOEIC **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	A l'issue de cet enseignement, les étudiants seront capables de : • Reconnaitre et anticiper les formats de certifications en anglais. • Compléter les réponses exigées par les tests de certifications. • Pouvoir optimiser leurs résultats aux certifications grâce à une méthodologie de travail appliquée lors des séances d'entrainement. At the end of this course, students will be able to: • Recognize and anticipate certification formats in English. • Complete the answers required by the certification tests. • To be able to optimize their results to certifications thanks to an applied work methodology during training sessions.
Contenu	*Se préparer pour obtenir une certification en anglais (objectif B2 et +)* • Présentation des formats • Exercices d'entrainement • Conseils pour optimiser son score *Prepare to obtain certification in English (objective B2 and +)* • Presentation of formats • Training exercises • Tips to optimize your score
Méthodes d'enseignement	Distanciel
Langue d'enseignement	Français
Bibliographie	• 200% TOEIC 2017 Listening & Reading (2 août 2016, de Michael Byrne et Michelle Dickinson) • TOEIC® La Méthode Réussite (20 janvier 2011, de David Mayer et Serena Murdoch Stern) • Tactics for TOEIC® Listening and Reading Test (13 septembre 2007, de Grant Trew) • Cambridge Grammar and Vocabulary for the TOEIC Test (11 novembre 2010, de Jolene Gear et Robert Gear)

XMS3PU900	**FLE (French as a Foreign Language)**
Lieu d'enseignement	Université de Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	
Volume horaire total	**TOTAL :** 0h Répartition : **CM :** 0h **TD :** 0h **CI :** 0h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	

Pondération pour chaque matière	FLE (French as a Foreign Language) **100%**
Obtention de l'UE	
Programme	
Objectifs (résultats d'apprentissage)	
Contenu	
Méthodes d'enseignement	
Langue d'enseignement	Français
Bibliographie	

XMS1PU640	**Fluid Dynamics**
Lieu d'enseignement	Faculté des Sciences de Nantes
Niveau	Master
Semestre	1
Responsable de l'UE	CARPY SABRINA
Volume horaire total	**TOTAL :** 48h Répartition : **CM :** 20h **TD :** 16h **CI :** 0h **TP :** 12h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	Mécaniques des fluides
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL),M2 Erasmus Mundus Joint Master in Planetary Geosciences,M1 Mécanique,M1 CMI-ICM
Evaluation	
Pondération pour chaque matière	Fluid Dynamics **100%**
Obtention de l'UE	Les notes de pratique à la deuxième session correspondent à un report des notes de pratiques de la première session. The practice notes for the second session are a carry-over from the practice notes of the first session. The detailed assessment procedures will be communicated to students at the start of the semester. If some changes are decided during the semester, these will be communicated to students at least 2 weeks in advance of the concerned evaluation.
Programme	

Objectifs (résultats d'apprentissage)	A l'issue de cette U.E., L'étudiant : • schématise et modélise un écoulement réel grâce à la méthode des fonctions potentiels et fonctions de courant de l'aérodynamique • met en équation un problème de dynamique des fluides • simplifie le problème à l'aide des hypothèses du problème et si besoin, grâce à une analyse dimensionnelle • détermine les solutions à l'aide des conditions aux limites et des conditions initiales • est capable d'appréhender les différences entre un fluide parfait et réel, laminaire et turbulent, stationnaire et instationnaire et de faire le lien entre la théorie et la pratique lors des séances de travaux pratiques • rédige un rapport détaillé sur les expériences réalisées en travaux pratiques dans un document synthétique avec des outils scientifiques adaptés (réalisation de schéma, écriture des équations,...) par groupe de deux ou trois **Learning outcomes :** - model a fluid dynamics problem - simplify the problem using the hypotheses of the problem and, if necessary, through a dimensional analysis - determine solutions using boundary conditions and initial conditions - understand the differences between a perfect and real fluid, laminar and turbulent, stationary and unsteady - schematize and models a real flow using the method of potential and current functions of aerodynamics - write a transport equation for temperature or concentration - write a detailed report on the experiments carried out in practical work in a synthetic document with adapted scientific tools (making a diagram, writing equations, etc.) in groups of two or three students
Contenu	-Fondamentaux de la mécanique des fluides (propriétés d'un fluide, cinématique des fluides, équation de Bernoulli, vorticité, fluide visqueux,...) -Solution des problèmes d'écoulement des fluides modélisés par des équations différentielles (équation d'onde, équation de diffusion, équation de Laplace) -Application aux écoulements à surface libre et aux couches limites -Travaux pratiques : écoulement laminaire dans une conduite, écoulement turbulent dans une conduite, écoulement autour d'un cylindre, mesures expérimentales de forces aérodynamiques sur des profils d'ailes. **Programme's content :** -Fundamentals of fluid mechanics (properties of a fluid, kinematics of fluids, Bernoulli's equation, vorticity, viscous fluid) -Solution of fluid-flow problems that are modelled by differential equations (wave equation, diffusion equation, Laplace's equation) -Application to Water waves and Boundary layers -Practical work: laminar flow in a pipe, turbulent flow in a pipe, flow around a cylinder in a wind tunnel, experimental measurements of aerodynamic forces on wing profiles.
Méthodes d'enseignement	Lectures, tutorials, practical work, distance learning, project mode
Langue d'enseignement	Anglais
Bibliographie	Mécanique des fluides, éléments d'un premier parcours, Chassaing, Cépaduès éditions ; Hydrodynamique Physique, Guyon, Hulin et Petit, CNRS éditions.

XMS4PU800	**Internship or project and workshops**
Lieu d'enseignement	
Niveau	Master
Semestre	4
Responsable de l'UE	CHEVREUIL PLESSIS MATHILDE
Volume horaire total	**TOTAL :** 23h Répartition : **CM :** 0h **TD :** 0h **CI :** 23h **TP :** 0h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	Problem Based learning
Parcours d'études comprenant l'UE	M2 Reliability based structural MAintenance for marine REnewable ENErgy (MAREENE-EL)
Evaluation	
Pondération pour chaque matière	Internship or project and workshops **100%**

Obtention de l’UE	
Programme	
Objectifs (résultats d'apprentissage)	At the end of this teaching unit, the student: • Solves a problem of industrial mechanics or research within a team • Identifies the methods necessary for solving • Models the problem posed and justifies the assumptions made • Produce a bibliography on the subject • Solve the problem and comment on the validity of its results • Complies with the requirements (rules, standards, means, communication) of the company or laboratory • Produces an internship report • Present his work orally Workshops: • Develop and practice peer feedback skills • Practice collaborative learning in a group • Design an action plan to deal with an initial individual challenge or curiosity • Practice presentation skills • Practice critical skills by giving feedback to peers • Reflect on hisr own skills and those of peers
Contenu	• The internship lasts between 4 and 6 months. It takes place either in a company or in a laboratory. In accordance with the French law the internship is paid. • The student is in charge of finding his internship. Proposals are addressed throughout the first semester but he can also find the internship by himself. • The choice of an internship must be validated by the training manager in order to verify the suitability of its content with training.
Méthodes d’enseignement	Internship or project in company or laboratory with follow-up by the supervisor and an academic tutor. Writing and defense of a thesis Collaborative online activities / seminars
Langue d’enseignement	Anglais
Bibliographie	

Dernière modification par VIRGINIE BLOT, le 2024-05-14 20:09:22