Master 2 M2 Erasmus Mundus Joint Master in Planetary Geosciences

Année universitaire

Information générale

Objectifs	The aim of the Erasmus Mundus Joint Master in Planetary Geosciences (EMJM-GeoPlaNet) is to give students an unique learning experience in planetary geosciences based on the strong expertise and collaboration inside an international research and training Consortium. This full International Master Program is based on Coimbra University (CU, Portugal) Masters degree in Astrophysics and Instrumentation for Space for Semester 1, in collaboration with Porto University , Universita' d'Annunzio in Chieti/Pescara (UA, Italy) Percorso in Planetary Sciences for Semester 2, in collaboration with Padova University, Earth and Planetary Sciences Master 2 Program at Nantes University (NU, France) for Semester 3 and an internship in a research laboratory of the GeoPlaNet Consortium during Semester 4
Responsable(s)	VERHOEVEN OLIVIER CARPY SABRINA
Mention(s) incluant ce parcours	master Sciences de la terre et des planètes, environnement
Lieu d'enseignement	Université de Nantes
Langues / mobilité internationale	- Parcours de M2 international, ouvert aux étudiants qui ont effectué le M1 à Nantes ou dans nos universités partenaires - Intégralement enseigné en anglais
Stage / alternance	
Poursuite d'études /débouchés	
Autres renseignements	
Conditions d'obtention de l'année	La validation du parcours respecte les M3C (Modalités de Contrôle des Connaissances et des Compétences, anciennement MCCA) qui s'organisent selon trois niveaux : • Niveau I : le Règlement Général de Contrôle des Connaissances et des Compétences (RG3C) de Nantes Université voté au CAC le 31 mars 2023, • Niveau II : les règles particulières de contrôle des connaissances et des compétences de la Faculté des Sciences et des Techniques votées au CG le 29 juin 2023, • Niveau III : les dispositions propres à chaque mention/parcours/UE/EC Les documents associés aux niveaux I et II sont consultables sur le Madoc Master UFR des Sciences et des Techniques -Section M3C. Les dispositions du niveau III sont précisées dans ce document. **Conditions de validation de l'année propre au parcours :** **• Règle de compensation :** Indiquer, dans cette rubrique, les règles de compensation au niveau : - des semestres : les semestres se compensent-ils entre eux ? - des groupes d'UE : les groupes d'UE se compensent-ils entre eux ? Si certains se compensent et d'autres non, il faudra préciser le nom des groupes qui ne se compensent pas. NB : Les UE d'un groupe d'UE se compensent automatiquement entre elles. Si vous souhaitez de la non compensation, il faudra utiliser une note seuil au niveau de l'UE. **• Notes seuil :** Indiquer, dans cette rubrique, si vous souhaitez mettre en place des notes seuils et les préciser le cas échéant. **Exemple :** la note d'un groupe d'UE ne peut être inférieure à 8/20. La note à une UE ne peut être inférieure à 8/20. Si ce seuil ne concerne pas la totalité des groupes d'UE et UE, il faudra indiquer le nom des éléments concernés par la note seuil. NB : la note seuil vaut sur les sessions 1 et 2. Il n'est pas possible de les modifier entre deux sessions. **• Informations spécifiques au parcours :** Espace libre pour des compléments d'informations spécifiques au parcours

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 : m2emjm-geoplanet (30 ECTS)																				
Science and Research Communication	XMS3GU030	1	0	0	0	0	0	0	0	0	12	12	0	0	4	4	0	0	0	16
Earth and Planetary Surface Processes	XMS3GU040	5	28	28	0	0	0	0	0	0	0	0	0	0	12	12	0	0	0	40
Earth and Planetary Interiors	XMS3GU050	5	28	28	0	0	0	0	0	0	0	0	0	0	12	12	0	0	0	40
Earth and Planetary Remote Sensing	XMS3GU060	3	8	8	0	0	0	0	0	0	0	0	0	0	24	24	0	0	0	32
Geographic Information Systems 2	XMS3GU070	2	4	4	0	0	0	0	0	0	4	0	0	4	16	16	0	0	0	24
Lab analyses and field geophysics	XMS3GU080	4	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0	0	0	35
Space Exploration Programs	XMS3GU010	3	0	0	0	0	24	0	0	0	0	0	0	0	0	0	0	0	0	24
Data Analysis	XMS3GU090	2	4	4	0	0	0	0	0	0	0	0	0	0	20	20	0	0	0	24
Fluid Dynamics	XMS1PU640	5	20	0	0	0	0	0	0	0	16	0	0	0	12	0	0	0	0	48
	Total	30																	0.00	**283.00**

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 : m2emjm-geoplanet (30 ECTS)																				
Internship STPE	XMS4GU020	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	30																	0.00	**0.00**

Modalités d’évaluation

Mention Master 2ème année | Parcours : M2 Erasmus Mundus Joint Master in Planetary Geosciences | Année universitaire

Responsable(s) : VERHOEVEN OLIVIER, CARPY SABRINA

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 : m2emjm-geoplanet																				
3	XMS3GU030	Science and Research Communication	N	obligatoire		1							0.5			0.5			1	1
3	XMS3GU040	Earth and Planetary Surface Processes	N	obligatoire	5							2.5					2.5		5	5
3	XMS3GU050	Earth and Planetary Interiors	N	obligatoire	5							2.5					2.5		5	5
3	XMS3GU060	Earth and Planetary Remote Sensing	N	obligatoire		3							1.5				1.5		3	3
3	XMS3GU070	Geographic Information Systems 2	N	obligatoire		2													2	2
3	XMS3GU080	Lab analyses and field geophysics	N	obligatoire		4							2				2		4	4
3	XMS3GU010	Space Exploration Programs	N	obligatoire	3							1.5					1.5		3	3
3	XMS3GU090	Data Analysis	N	obligatoire		2							1			1			2	2
1	XMS1PU640	Fluid Dynamics	N	obligatoire	3.5	1.5							1.5		3.5				5	5
Groupe d'UE : m2emjm-geoplanet																				
4	XMS4GU020	Internship STPE	N	obligatoire	15		15												30	30
																		TOTAL	60	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 : m2emjm-geoplanet																				
3	XMS3GU030	Science and Research Communication	N	obligatoire		1							0.5			0.5			1	1
3	XMS3GU040	Earth and Planetary Surface Processes	N	obligatoire	5							2.5					2.5		5	5
3	XMS3GU050	Earth and Planetary Interiors	N	obligatoire	5							2.5					2.5		5	5
3	XMS3GU060	Earth and Planetary Remote Sensing	N	obligatoire		3							1.5				1.5		3	3
3	XMS3GU070	Geographic Information Systems 2	N	obligatoire		2													2	2
3	XMS3GU080	Lab analyses and field geophysics	N	obligatoire		4							2				2		4	4
3	XMS3GU010	Space Exploration Programs	N	obligatoire	3							1.5					1.5		3	3
3	XMS3GU090	Data Analysis	N	obligatoire		2							1			1			2	2
1	XMS1PU640	Fluid Dynamics	N	obligatoire	3.5	1.5							1.5		3.5				5	5
Groupe d'UE : m2emjm-geoplanet																				
4	XMS4GU020	Internship STPE	N	obligatoire				15		15									30	30
																		TOTAL	60	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

XMS3GU030	Science and Research Communication
Lieu d'enseignement	
Niveau	Master
Semestre	3
Responsable de l'UE	VERHOEVEN OLIVIER
Volume horaire total	**TOTAL :** 16h Répartition : **CM :** 0h **TD :** 12h **CI :** 0h **TP :** 4h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Erasmus Mundus Joint Master in Planetary Geosciences,M2 Earth and Planetary Sciences
Evaluation	
Pondération pour chaque matière	Scientific and Research Communication **100%**
Obtention de l'UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	Analyze any type of scientific publication, organize a literature review, summarize any type of scientific publication, present a research topic in a condensed and clear way, search for research positions and apply for them, understand the process of scientific communication, manage data and open science.
Contenu	Activities of the researcher, scientific method, scientific journals, peer review system and the scientific impact metrics, writing scientific papers, grant proposals, oral and poster presentations, presentation of articles from Surface and Interior Modules, open science principles and data archive.
Méthodes d'enseignement	
Langue d'enseignement	Français
Bibliographie	

XMS3GU040	Earth and Planetary Surface Processes
Lieu d'enseignement	Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	LE DEIT LAETITIA
Volume horaire total	**TOTAL :** 40h Répartition : **CM :** 28h **TD :** 0h **CI :** 0h **TP :** 12h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Earth and Planetary Sciences,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Earth and Planetary Surface Processes **100%**
Obtention de l'UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. In the second session, the exam will include written and/or oral and/or practical tests. 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)	- Apply geological concepts, theories and methods to the study of planetary surfaces. - Recognise, analyse and interpret planetary surface landsystems and mineral assemblages, with reference to geological models. - Assess the relevance of observational data, experimental data and models for the interpretation of surface processes on the Earth and other bodies of the Solar System. - Determine planetary surface ages. - Produce mineralogical, morphological and geological maps of planetary surfaces.
Contenu	Main processes that drive the evolution of icy and rocky surfaces on the Earth, Planets and other Bodies of the Solar System: - deformation processes and landforms, - volcanic processes and landforms, - impact cratering processes and landforms, - erosion, transport and sedimentation processes and landforms, - weathering processes and minerals, - dating planetary surfaces, - mineralogical, morphological and geological mapping of planetary surfaces.
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

XMS3GU050	**Earth and Planetary Interiors**
Lieu d'enseignement	Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	SOTIN CHRISTOPHE
Volume horaire total	**TOTAL :** 40h Répartition : **CM :** 28h **TD :** 0h **CI :** 0h **TP :** 12h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	Géophysique et/ou Géochimie et/ou Physique mécanique niveau M1 avec bases de géologie, issus de l'Université de Nantes ou de l'extérieur
Parcours d'études comprenant l'UE	M2 Earth and Planetary Sciences,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Earth and Planetary Interiors **100%**
Obtention de l'UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	Translate geophysical and geochemical observables in terms of thermal structure, composition and mechanical properties, integrate the physico-chemical mechanisms governing the dynamics of planetary interiors and their thermal evolution, understand the physico-chemical couplings between themain constituent domains of planetary interiors, relate the diversity of planetary evolutions with their internal structure.
Contenu	Parameters of planetary internal structures, knowledge and interrogations brought by terrestrial observations and space missions, geophysical methods in planetology, structures and evolutions of the solid bodies of the solar system, exoplanets.
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

XMS3GU060	Earth and Planetary Remote Sensing
Lieu d'enseignement	Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	LE DEIT LAETITIA GERNEZ PIERRE
Volume horaire total	**TOTAL :** 32h Répartition : **CM :** 8h **TD :** 0h **CI :** 0h **TP :** 24h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	
Parcours d'études comprenant l'UE	M2 Earth and Planetary Sciences,M2 Écosystèmes et Bioproduction Marine,M2 Erasmus Mundus Joint Master in Planetary Geosciences,M2 Cartographie et Gestion de l'Environnement
Evaluation	
Pondération pour chaque matière	Earth and Planetary Remote Sensing **100%**
Obtention de l'UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	At the end of the course, students will be able to • understand what physico-chemical information can be extracted from imaging spectrometer data acquired over Earth and other planets and moons of the solar system • correct hyperspectral images from atmospheric effects using empirical and physical approaches • extract quantitative information from hyperspectral images • use hyperspectral images to map surface compositions • understand how light propagates into the ocean • understand how above-water reflectance can be used to quantitavely retrieve biogeophysical information on the main seawater colored constituent • download ocean color satellite data from several web portals • read OC satellite data, and apply several turbidity and chlorophyll inversion algorithms • draw chlorophyll concentration and turbidity maps • estimate the influence of turbidity and chlorophyll concentration on oysters using satellite data
Contenu	• Physical principles of hyperspectral remote sensing (imaging spectroscopy) • Image quality - Image calibration • Atmospheric correction methods • Extraction of physico-chemical parameters - Surface composition, grain size, moisture content, etc. • Aplication to Earth and Planetary surfaces • First concepts in marine optics: inherent and apparent optical properties • Main seawater colored constitutants • Introduction to ocean color remote sensing: chlorophyll algorithms in case 1 waters • Ocean color remote sensing in coastal waters • Particular case of turbid waters: turbidity and chlorophyll algorithms • Application of Ocean color remote sensing to bivalve aquaculture
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	Textbooks • Mobley, C., 1994. Light and Water. Academic Press. • Kirk, J.T.O., 1994, Light and Photosynthesis in Aquatic Ecosystems, Second Edition. Cambridge University Press. Websites • http://www.oceanopticsbook.info/

XMS3GU070	Geographic Information Systems 2
Lieu d'enseignement	Nantes

Niveau	Master
Semestre	3
Responsable de l'UE	LE DEIT LAETITIA FREIRE BOA DE JESUS BRUNO
Volume horaire total	**TOTAL :** 24h Répartition : **CM :** 4h **TD :** 4h **CI :** 0h **TP :** 16h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	Geographic Information Systems 1 (GIS 1).
Parcours d'études comprenant l'UE	M2 Earth and Planetary Sciences,M2 Écosystèmes et Bioproduction Marine,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Geographic Information Systems 2 **100%**
Obtention de l'UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. This course is in ECI (évaluation continue intégrale). 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)	After completing this teaching unit, the student will: • Be aware of the usefulness of Geographic Information Systems (GIS) and the possible applications to earth and environmental sciences. • Understand and master the concepts of geographic and projected coordinate systems, the different data types and associated databases. • Be able to use basic and advanced functions of a GIS (e.g., perform spatial data analysis, automatic data processing, produce a complex map). • Be able to collect data required to implement a GIS in the domain of earth, planetary, and environmental sciences.
Contenu	This teaching unit builds upon concepts introduced in GIS 1 and provides a thorough overview of GIS functions required to perform combined analyses of spatial datasets in earth and environmental sciences. Fundamental GIS concepts are presented in the form of lectures. Technical skills are developed by hands-on training using concrete examples applied to earth, planetary, and environmental sciences. *Fundamental GIS concepts:* Geographic and projected coordinate systems; Different types of data (vector, raster, attributes) and metadata ; Databases; Data suppliers; Web Feature and Map Services; GIS softwares; and online GIS. *Advanced spatial data analyses*: Creating, editing, and managing vector data; Operations with vector data (field calculations and geometry operations) ; Operations with raster data (classifications, data extraction); Georeferencing raster data; Joins and relates; Spatial statistics. *Automation of data processing*: batch processing, models, Python and SQL scripting. *Produce a complex map* using proper semiology and mandatory information.
Méthodes d'enseignement	
Langue d'enseignement	Anglais
Bibliographie	

XMS3GU080	**Lab analyses and field geophysics**
Lieu d'enseignement	IFSTTAR Nantes
Niveau	Master
Semestre	3
Responsable de l'UE	MORIZET YANN
Volume horaire total	**TOTAL :** 35h Répartition : **CM :** 0h **TD :** 0h **CI :** 0h **TP :** 35h **EAD :** 0h
Place de l'enseignement	
UE pré-requise(s)	

Parcours d’études comprenant l’UE	M2 Earth and Planetary Sciences,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Lab analysis and field geophysics **100%**
Obtention de l’UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	Synthesize in a report chemical, mineralogical and crystallochemical data obtained from laboratory rock analyzes, be able to quantitatively describe the behavior of natural systems and the principles of geophysical measurement using mathematical models based on physics, perform analyzes by applying a specific protocol and geophysical processing through numerical software, calculate structural chemical formulas of minerals and report them in ternary diagrams in order to identify them.
Contenu	Raman spectroscopy, mineralogy, chemistry, and field geophysics.
Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

XMS3GU010	**Space Exploration Programs**
Lieu d’enseignement	
Niveau	Master
Semestre	3
Responsable de l’UE	CARPY SABRINA
Volume horaire total	**TOTAL :** 24h Répartition : **CM :** 0h **TD :** 0h **CI :** 24h **TP :** 0h **EAD :** 0h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Earth and Planetary Sciences,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Space Exploration Programs **100%**
Obtention de l’UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	Knowledge of current space exploration programs and scientific challenges, identify the many facilities associated to the preparation, design, implementation and management of space exploration programs.
Contenu	History of the solar system, structure and dynamics of planets and moons highlighted by space missions, understanding of the operating modes of international space science projects. Conferences (decadal survey) + on-site or virtual visits of the ESTEC center.
Méthodes d’enseignement	
Langue d’enseignement	Anglais
Bibliographie	

XMS3GU090	Data Analysis
Lieu d’enseignement	Nantes
Niveau	Master
Semestre	3
Responsable de l’UE	VERHOEVEN OLIVIER
Volume horaire total	**TOTAL :** 24h Répartition : **CM :** 4h **TD :** 0h **CI :** 0h **TP :** 20h **EAD :** 0h
Place de l’enseignement	
UE pré-requise(s)	
Parcours d’études comprenant l’UE	M2 Earth and Planetary Sciences,M2 Erasmus Mundus Joint Master in Planetary Geosciences
Evaluation	
Pondération pour chaque matière	Data Analysis **100%**
Obtention de l’UE	Continuous assessment (100%) will include written and/or oral and/or practical tests, in person and/or remotely. The second session will be an oral test. 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)	Analyze, interpret and model data. Identify the appropriate analysis technique according to the nature and the type of data. Learn the limits of the different data processing techniques. Master the statistical tool in data characterization. Master Python as programming language and use data processing software.
Contenu	- Fourier Analysis - Time-frequency and time-scale representations - Correlation analysis - Filters
Méthodes d’enseignement	
Langue d’enseignement	Anglais
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.

XMS4GU020	**Internship STPE**
Lieu d'enseignement	
Niveau	Master
Semestre	4
Responsable de l'UE	BOURGEOIS OLIVIER
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 Erasmus Mundus Joint Master in Planetary Geosciences,M2 Earth and Planetary Sciences
Evaluation	
Pondération pour chaque matière	Internship STPE **100%**
Obtention de l’UE	No second session for this UE.
Programme	
Objectifs (résultats d'apprentissage)	- Acquire, process, analyze and interpret scientific and technical data - Define or insert yourself into a project in a professional environment - Carry out and present a project in a professional environment - Remobilize your theoretical knowledge in a complex professional context - Place your work in a scientific, technical, industrial, economic or societal context - Make effective written and oral presentations in a professional context - Work independently and in a team - Concretely apply job search techniques - Insert yourself into professional networks
Contenu	The aim of the internship is to introduce the student to professional life by producing an original research work under the supervision of a tutor. The internship must last at least 5 months and at most 6 months. The organisation and its localisation as well as the subject of the internship and research project must be approved by the by the Joint Management Program Committee (JPMC) of the EMJM Program. At the end of the research project, the student will have to submit a dissertation and defend it during an oral presentation. The dissertation will be submitted to a jury appointed by the JPMC. All internships will be supervised locally at the internship institution by a local supervisor and tutored by a faculty/researcher from NU. The internship is subject to an agreement signed between Nantes University, the intern and the host organisation, in which are indicated the subject of the internship, the name of the professional supervisor and of the university referent teacher. The professional supervisor manages the work of the intern. The referent teacher ensures the smooth running of the internship by guiding the student from the drafting of the internship agreement to the defence.
Méthodes d’enseignement	
Langue d’enseignement	Français
Bibliographie	

Dernière modification par VIRGINIE BLOT, le 2024-06-11 20:25:11