

AGREEMENT OF INTERUNIVERSITY COOPERATION FOR THE AWARDING OF A DOUBLE DEGREE (2ND CYCLE)

Between

UNIVERSITA' DEGLI STUDI DI VERONA, hereafter referred to as "UNIVR", represented by its
Rector, Prof. **Nicola Sartor**, Via Dell'Artigliere, 8 – 37129 Verona

and

UNIVERSITÉ PARIS SACLAY, hereafter referred to as "UPSaclay", represented by its President,
Gilles Bloch, Espace Technologique, Immeuble Discovery, route de l'Orme aux Merisiers, 91190
Saint Aubin, France

and

UNIVERSITÉ D'EVRY-VAL-D'ESSONNE, hereafter referred to as "UEVE", represented by its
President, **Patrick Curmi**, Boulevard François Mitterrand, 91025 Evry Cedex, France.

and

ÉCOLE NATIONALE SUPÉRIEURE D'INFORMATIQUE POUR L'INDUSTRIE ET
L'ENTREPRISE, hereafter referred to as "ENSIIE", represented by its Director, **Ménad Sidahmed**, 1,
Square de la Résistance, 91025 Evry Cedex, France

Together named "The Parties"

Preamble

- the Italian Ministerial Decree DM 270/2004 allows Italian universities to jointly award degrees (2nd cycle) with other international universities;
- the French Education code, articles D613-17 to D613-25, defines the modalities of issuing diplomas in International partnerships and allows French and international partner universities to simultaneously award a degree specific to each of them;
- the School of Science and Engineering of Università di Verona has established and activated (from a.y. 2014/15) the degree programme "*Laurea Magistrale in Mathematics*";

- The Université Paris-Saclay was created on January 1st, 2015, to bring together 18 existing institutions to share a common higher education, research and innovation strategy. UPSaclay organizes a territorial coordination as a group "Paris Saclay", in which the University of Evry Val d'Essonne (hereinafter UEVE) is taking part, as well as the École nationale supérieure d'informatique pour l'industrie et l'entreprise (ENSIIE);
- UPSaclay delivers doctoral degrees and most of master's degrees previously issued by its Members, Associated and Partner Institutions, including UEVE and ENSIIE;
- Notions of UPSaclay Member, Partner or Associate, and Operator Institutions are defined in the French Decree No. 2014-1674 of December 29th, 2014, respectively, in the articles 2.1, 2.3 and 4, paragraph 2;
- UPSaclay delivers a UPSaclay Master's degree of "*Mathématiques et Applications, parcours Mathématiques Financières*" (*Mathematics and Applications, pathway Financial Mathematics, specialization Engineering and Finance*), for which the Operator Institutions are UEVE (Mathematics Department) and ENSIIE. (*formerly Master's degree in Mathematical Engineering Specialization Financial Engineering*);
- To benefit from UPSaclay training and graduation, students apply to the Université Paris-Saclay and, once admitted, they enroll in the Operators Institutions;
- Since 2017, UNIVR and UEVE have established a cultural exchange partnership, involving their above mentioned Degree programmes and concerning student and faculty exchange programmes and scientific cooperation in the field of applied mathematics;
- Considering the very satisfying review of the collaboration between UNIVR, and UEVE since 2017 the Parties agree to carry on and develop the underway collaboration by establishing a cooperation agreement for the granting of a double degree in the field of Applied Mathematics;
- UNIVR, UEVE and ENSIIE, with their resources and funds and in accordance with the law and regulations of their respective country, will collaborate and host all students, faculty members and administrative staff who participate in the mobility programme as described in this Agreement.

It is agreed and stipulated as follows:

Art.1 – Preamble and annexes

Preamble and annexes are an integral part of this Agreement.

Art. 2 - Objective of the Agreement

The Parties agree to establish a DDP which will last two full academic years (120 ECTS). The students successfully participating in the DDP, who have been registered at the host university to attend at least one semester (but not more than two semesters), will be issued at the end of this(se) semester(s) two second cycle degrees: *Laurea Magistrale in Mathematics* of UNIVR and UPSaclay Master's Degree of "*Mathématiques et Applications, parcours Mathématiques Financières*".

Art. 3 - Students

3.1. Student Exchange

The Parties agree on the number of students to participate in the DDP. It is 5 students maximum per university per academic year.

The Parties may however decide together of a higher number of students through mutual consent.

All exams successfully passed by students at the host university shall be automatically recognized by the home university, according to Annex 1, which includes tables showing how the academic curricula of the two universities compare.

Students involved in the mobility programme shall also enjoy the benefits of the host country and shall be likewise subject to the regulations and norms which are in force in the participating DDP universities.

3.2. Selection of students

Students admitted to the multiple degree programme will be selected by each home university according to their own criteria and modalities. As a general guideline, students will be selected on the basis of academic merit, past work and extracurricular experiences, as well as a demonstration of strong motivation to participate in the programme.

Each university organizes the selection of the students independently of the other institutions. Students from UNIVR will be selected by the *Admission Board appointed by the Didactic Council of Matematica*, which is responsible for the admission of students enrolling in the *Laurea Magistrale*. Students from UEVE and ENSIIE will be selected by a *jury composed of teachers of the UPSaclay Master's Degree of "Mathématiques et Applications, parcours Mathématiques Financières"*.

The host university has the right not to accept the students selected by the home university on the basis of their curriculum and/or of missing requirements for the overall enrollment at the home institution. On the basis of the yearly defined deadline for submission of the applications by students who want to

participate in the DDP, each university will forward to the relevant partner the list of selected candidates within one month after the students' applications. The host university may decide not to accept a student within one month after receipt of the list of selected candidates.

3.3. Enrolment and Mobility

Students from UNIVR who want to attend the multiple degree programme at UEVE or ENSIIE must be enrolled in the Laurea Magistrale in Mathematics, pathway "applied mathematics" of UNIVR, must have adequate knowledge of the English language (equivalent to CEFR level B2) and must hold a valid visa or residence permit. Students shall be transferred to UEVE or ENSIIE to attend - in accordance with Annex 2 - any teaching offered within Master's Degree of "Mathematics and Applications" pathway "Financial Mathematics", specialization "Engineering and Finance". Students must obtain a minimum of 30 ECTS credits and no more than half of the credits provided by the degree programme at the partner university.

Students from UPSaclay (enrolled at UEVE or at ENSIIE) who want to attend the double degree programme at UNIVR, must be enrolled in the UPSaclay Master's Degree of "Mathématiques et Applications, parcours Mathématiques Financières ", must have an adequate knowledge of the English language (equivalent to CEFR level B2) and must hold a valid visa or residence permit.

Students shall be transferred to UNIVR and register at the host university in order to attend- in accordance with Annex 3 - any teaching offered within the Laurea Magistrale in Mathematics of UNIVR. Students must obtain a minimum of 30 ECTS credits and no more than half of the credits provided by the degree programme at the partner university.

3.4. Tuition fee waiver and diploma fees

Students participating in the DDP enroll and pay tuition (if any) at their home university (the university of first enrolment). Students will have to pay non waivable diploma or social fees for student services at the host university, if any. All other charges, including health insurance, shall be borne by the students themselves, unless home institutions provide specific scholarships for the DDP

3.5. Transcript of Record

Each university sends a certificate to the partner university indicating courses and academic performance of each DDP student. The exams given at the partner university will be certified in a transcript of records.

Host universities shall issue and award each DDP student a certificate indicating his/her attended courses and his/her academic performance, together with the number of credits obtained at the partner university.

3.6. Insurance obligation for students participating in the DDP

UNIVR confirms that its regularly admitted students are insured against any accident incurred during their period of study abroad for the activities concerned by this Agreement and that they are insured for legal liability against damage which they may involuntarily cause to third parties (people or their properties).

UEVE confirms that its regularly enrolled students are responsible for their own health and accident coverage. They are responsible for taking out an insurance against any accident incurred during their period of study abroad for the activities concerned by this Agreement, and for legal liability against damage which they may involuntarily cause to third parties (people or their properties).

ENSIIE confirms that its regularly enrolled students are responsible for their own health and accident coverage. They are responsible for taking out an insurance against any accident incurred during their period of study abroad for the activities concerned by this Agreement, and for legal liability against damage which they may involuntarily cause to third parties (people or their properties).

3.7. Services offered

Students participating in the DDP enjoy the same student services as those offered by the host university to all of its students.

Art. 4 - Didactics

4.1. Study programmes

The inter-university cooperation agreement for the awarding of a multiple degree is based upon the correspondence between the study programmes of the *Laurea Magistrale (2nd cycle degree) in Mathematics of UNIVR* and the UPSaclay Master's Degree of "*Mathématiques et Applications, parcours Mathématiques Financières*", as presented in the Annex 1 of the present Agreement.

Students taking part to the DDP will follow the study programmes described in Annexes 2 and 3. This study programme will run from the start of the course until the final examinations for the degree.

The home institution recognizes the examination results of the students during the exchange period at the host institution. According to the regulations and exam contents of the host institution, exams are taken at the host institution during the exchange period.

4.2 Modifications to study programme

The study programme of the universities as in Annexes 2 and 3 can be modified by mutual consent of the Parties by written notice exchange, with no detriment to students already enrolled. In such case, annexes will be consequently updated without reviewing the present agreement.

4.3. Awarding of the degree qualification

Students participating in the DDP and obtaining the (2nd cycle) degree qualification at the home university: *Laurea Magistrale in Mathematics of UNIVR* or *UPSaclay Master's Degree of "Mathematiques et Applications, parcours Mathématiques Financières"*, will be awarded the degree of the partner university as defined in the correspondence table annexed to this Agreement (Annex 1), after submitting the relevant academic documentation as soon as the article 3.5. has been fulfilled. The student will receive the degree certificates and diploma supplements of the two degree awarding institutions

At the end of the study programme the home institution sends a certificate to the partner University indicating for each student all the attended courses including marks and credits.. The two universities confer the academic degree and the degree mark in compliance with their own regulations.

Art. 5 - Exchange of faculty members and administrative staff

5.1. Exchange modalities

Each Institution shall inform the personnel in mobility in the framework of the DDP about laws in force in the host country.

Staff in mobility will remain subject to their contractual obligations with the home University, will continue to receive their salary and enjoy their legal rights according to the legislative standards of their home country.

In all cases, the home University indicates the length of stay as an ordinary service period.

5.2 Activities for teachers and administrative personnel

Faculty members and researchers of the Parties can hold courses and lectures, carry out tutorship activities, participate in seminars, be part of exams, final thesis and doctorate commissions at one of the partner universities, and take part in research activities and meetings for DDP student exchange programme planning, evaluation and development, held at one of the partner universities.

The administrative staff will have the possibility of participating in meetings for student exchange programme planning, evaluation and development and will be able to carry out special visits in order to analyze the management systems operating at the partner university.

The Parties agree that all financial agreements will be negotiated and will depend on the availability of funds. Each university will cover all the costs for their own professors and research fellows, according to availability of Erasmus Plus programme funds or other funds.

During their period at the hosting university, faculty members, researchers and staff of the partner universities carrying out the above-mentioned activities, will be considered as staff "on a mission" abroad.

5.3. Insurance obligation

UNIVR confirms that its employees and staff (teachers and administrative personnel) are insured against any accident occurred during their period of stay abroad for the activities concerned by this Agreement and that they are insured for legal liability against damage which they may involuntarily cause to third parties (people or their properties).

UEVE confirms that its employees and staff (teachers and administrative personnel) are insured against any accident occurred during their stay abroad for the activities under this Agreement, in accordance with French laws and regulations. Social health coverage and repatriation insurance will be borne by UEVE. Employees and staff will however be responsible for obtaining adequate insurance to protect themselves against civil liability for damage which they may involuntarily cause to third parties (people or their properties).

ENSIIE confirms that its employees and staff (teachers and administrative personnel) are insured against any accident occurred during their stay abroad for the activities under this Agreement, in accordance with French laws and regulations. Social health coverage and repatriation insurance will be borne by ENSIIE. Employees and staff will however be responsible for obtaining adequate insurance

to protect themselves against civil liability for damage which they may involuntarily cause to third parties (people or their properties).

Art. 6 - Prevention and security

UNIVR, , UEVE and ENSIIE will provide each mobility programme participant with detailed information about the specific risks existing in the work environment in which they will operate and carry out their function and with necessary documentation about the prevention and emergency security measures and provisions in force in relation to their activity and the name of the personnel in charge of prevention and safety, in conformity with the legislative norms and regulations in force in the country of the hosting university and relevant European Union Rules.

Art. 7 - Other activities

The Parties can extend the cooperation agreement for other purposes beyond the student exchange. Further cooperation projects, including the issuance of intensive courses, distance learning, joint research programme, organization of seminars, symposia, and interviews on common interest topics and all other activities consolidating the cooperation, will be encouraged by partner universities. These projects will be subject to specific addenda to this Agreement document, which will be stipulated by the Parties.

Each Party agrees to promote this programme in their catalogues and websites. The related costs will be borne by the Institutions individually, except in special cases agreed in writing and accepted by the Parties.

Art. 8- Responsible for the Agreement/academic commission

So as to guarantee the correct development of the double degree programme, an Academic Commission will be formed by one representative of each of the two master's programme (UNIVR and UPSaclay)

This Academic Commission will be responsible for evaluating the efficiency of the study programme and the academic results achieved by the students, as well as the resources supplied by both institutions.

The Academic Commission will also be in charge of suggesting modifications for improving the quality of the programme. The members of this Commission will meet at least once a year, either in person or online.

More specifically, the Academic Commission is responsible for defining the regulations and procedures for admission to the double degree programme, as well as the access conditions and the selection of students who will participate in the programme.

Art. 9 - Evaluation of the programme

The Academic Commission (see art. 8) will consult each other when appropriate, but at least once a year, in order to evaluate the programme development, to draw up a report about the ongoing initiatives and to elaborate other cooperation programmes.

Art. 10 - Use of name/logo

Each Party may use the logos, names and other trademarks of the other parties only in connection with the DDP. Each Party must inform the other parties for press announcements, marketing and other reasonable promotional activities involving the DDP through the appropriate use of the logos, names and trademarks of the parties.

Art. 11 - Intellectual Property

UNIVR, UEVE and ENSIIE retain all intellectual property rights or other proprietary rights to all documents, such as brochures, media, research or teaching methods, procedures, processes and / or teaching experience, whatever their nature and the media related to the DDP (hereinafter referred to as "Documents"). Consequently, no provision of the Agreement shall be considered by the Parties as mutually conferring any right or ownership of intellectual property on the said documents, in whole or in part.

The use by a Party of any of the documents is subject to the prior written consent of the owner Party and is exclusively limited to the purpose of performing the obligations under the Agreement and for the duration thereof. This use is granted free of charge.

Art. 12 Disputes / litigation

In case of dispute about an article of this Agreement, the parties will do their utmost to resolve the issue amicably and in good faith. If the dispute could not be settled amicably, it shall be brought before the competent court of the defendant's domicile.

Art. 13 - Duration and termination of the Agreement

This Agreement shall take effect on the date of signing and will be effective for a period of five (5) academic years starting from the academic years 2019/20. The last cohort of students participating in the DDP will be the one enrolled in a.y. 2023/24 and the last mobility will be possible in a.y 2024/25. The present agreement will be renewed for identical periods unless cancelled in writing 6 months before the expiry date.

It may be denounced by one or other of the Parties, subject to 6 months' notice.

In case of amendment or early termination of this agreement, students who have already integrated the DDP will be allowed to complete their year, even if the agreement will be considered null and void, and will receive their multiple degrees.

The annexes to this Agreement may be amended by mutual consent of the Parties in writing, without this being to the detriment of students who integrated the DDP.

Art. 14- Copies and language

This Agreement is undersigned in four originals in English and four originals in French. All eight documents are equivalently valid for the purposes of law. In doubt, the English version shall prevail.

LM MATHEMATICS - (Applied) UNIVR - 2019/20			
MODULES	YEAR	SEM	ECTS
Functional analysis	1		12
Differential geometry	1		6
Data fitting and reconstruction	1/2		6
Numerical methods for partial differential equations			
Free choice modules	1		6
Partial differential equations	1		6
Analytical Mechanics	1		6
Stochastic calculus	1		6
2 modules among the following	1/2		12
Numerical methods for mathematical finance			
Mathematical finance			
Mathematics for decisions			
Numerical modelling and optimization			
Mathematical methods in the applied sciences			
Data fitting and reconstruction			
Numerical methods for partial differential equations			
Advanced geometry			
Foundation of data analysis			
Statistical learning			
Partial differential equations			
Algebraic Geometry			
Mathematical methods for computer science			
Homological algebra			
One module out of the following two	1/2		6
Computational algebra			
Representation Theory			
Optimization			
Free choice modules	2		6
Master Thesis dissertation (preparazione alla tesi)	2		8
Further activities	1/2		4
1 module among the following	1/2		6
Master Thesis dissertation	2		24
			120

ME 78 Mathématiques et Applications - PARIS SACLAY			
ECTS	YEAR	SEM	MODULES
12	M 1	S1	Analyse Fonctionnelle
			Projet informatique et méthode agile
			Statistiques et applications
			Recherche Opérationnelle
			Modèles linéaires généralisés et extensions
4	M1	S1	Analyse des données
4	M1	S1	Programmation avancée et projet
4	M1	S1	Processus Stochastique
3	M1	S1	Langues et formation humaines
3	M1	S1	Economie-Gestion
4	M1	S2	Analyse des EDP
6	M1	S2	Stage Entreprise
4	M1	S2	Calcul Stochastique
8	M1	S2	
			Méthodes de simulation
			Instruments et Modèles financiers
			Complément en Recherche opérationnelle
			Séries temporelles
			Apprentissage statistique
			Statistique asymptotique
8	M1	S2	Stage entreprise/projec
5	M2	S3	Méthodes algorithmiques et décisionnelles pour la finance
7	M2	S3	Processus Stochastique
7	M2	S3	Finance
4	M2	S3	Assurance
4	M2	S3	Projet informatique
3	M2	S3	Anglais
4	M2	S4	Finance numérique
5	M2	S4	Finance 2
3	M2	S4	Projet au choix
3	M2	S4	Anglais
3	M2	S4	Projet en Finance Quantitative
12	M2	S4	Stage Professionnel
120			

LM MATHEMATICS - (Applied) UNIVR - 2019/20				
MODULES	YEAR	SEM	ECTS	
Functional analysis	1		12	
Differential geometry	1		6	
Data fitting and reconstruction	1		6	
Numerical methods for partial differential equations	1		6	
Partial differential equations	1		6	
Analytical Mechanics	1		6	
Stochastic calculus	1		6	
2 modules among the following	1/2		12	
Numerical methods for mathematical finance				
Mathematical finance				
Mathematics for decisions				
Numerical modelling and optimization				
Mathematical methods in the applied sciences				
Data fitting and reconstruction				
Numerical methods for partial differential equations				
Advanced geometry				
Foundation of data analysis				
Statistical learning				
Partial differential equations				
Algebraic Geometry				
Mathematical methods for computer science				
Homological algebra				
Free choice modules	1/2		6	
One module out of the following two			6	
Computational algebra				
Representation Theory				
Optimization	2		6	
Free choice modules	1/2		6	
Master Thesis dissertation	2		8	
Further activities	1/2		4	
1 module among the following	1/2		6	
Master Thesis dissertation	2		24	
			120	

ME 78 Mathématiques et Applications - PARIS SACLAY			
ECTS	YEAR	SEM	MODULES
12	M1	S1	Analyse Fonctionnelle
			Projet informatique et méthode agile
			Statistiques et applications
			Recherche Opérationnelle
			Modèles linéaires généralisés et extensions
4	M1	S1	Analyse des données
4	M1	S1	Programmation avancée et projet
4	M1	S1	Processus Stochastique
4	M1	S2	Analyse des EDP
6	M1	S2	Stage Entreprise
4	M1	S2	Calcul Stochastique
8	M1	S2	
			Méthodes de simulation
			Instruments et Modèles financiers
			Complément en Recherche opérationnelle
			Séries temporelles
			Apprentissage statistique
			Statistique asymptotique
8	M1	S2	Stage entreprise/projec
3	M1	S1	Langues et formation humaines
3	M1	S1	Economie-Gestion
5	M2	S3	Méthodes algorithmiques et décisionnelles pour la finance
7	M2	S3	Processus Stochastique
7	M2	S3	Finance
4	M2	S3	Assurance
4	M2	S3	Projet informatique
3	M2	S3	Anglais
4	M2	S4	Finance numérique
3	M2	S4	Projet au choix
3	M2	S4	Anglais
5	M2	S4	Finance 2
3	M2	S4	Projet en Finance Quantitative
12	M2	S4	Stage Professionnel
			120

ME 78 Mathématiques et Applications - PARIS SACLAY			
MODULES	YEAR	SEM	ECTS
Analyse Fonctionnelle	M1	S1	12
Projet informatique et méthode agile			
Statistiques et applications			
Recherche Opérationnelle			
Modèles linéaires généralisés et extensions			
Analyse des données	M1	S1	4
Programmation avancée et projet	M1	S1	4
Processus Stochastique	M1	S1	4
Langues et formation humaines	M1	S1	3
Economie-Gestion	M1	S1	3
Analyse des EDP	M1	S2	4
Stage Entreprise	M1	S2	6
Calcul Stochastique	M1	S2	4
	M1	S2	8
Complément en Recherche opérationnelle			
Méthodes de simulation			
Séries temporelles			
Instruments et Modèles financiers			
Apprentissage statistique	M1	S2	8
Statistique asymptotique			
	M1	S2	8
Stage entreprise/projec			
Finance	M2	S3	7
Processus Stochastique	M2	S3	7
	M2	S3	5
Méthodes algorithmiques et décisionnelles pour la finance			
Assurance	M2	S3	4
Projet informatique	M2	S3	4
Anglais	M2	S3	3
Finance numérique	M2	S4	4
Projet au choix	M2	S4	3
Anglais	M2	S4	3
Finance 2	M2	S4	5
Projet en Finance Quantitative	M2	S4	3
Stage Professionnel	M2	S4	12
120			

LM MATHEMATICS - (Applied) UNIVR - 2019/20				
ECTS	YEAR		MODULES	
12	1		Functional analysis	
6	1		Differential geometry	
6	1/2		Data fitting and reconstruction	
			Numerical methods for partial differential equations	
6	1		Free choice modules	
0	6	1	Partial differential equations	
	6	1	Analytical Mechanics	
	6	1	Stochastic calculus	
	12	1/2		2 modules among the following
				Numerical methods for mathematical finance
				Mathematical finance
				Mathematics for decisions
				Numerical modelling and optimization
				Mathematical methods in the applied sciences
				Data fitting and reconstruction
				Numerical methods for partial differential equations
				Advanced geometry
				Foundation of data analysis
				Statistical learning
				Partial differential equations
				Algebraic Geometry
				Mathematical methods for computer science
				Homological algebra
	6	1/2		Free choice modules
6	2		Optimization	
6			<i>One module out of the following two</i>	
			Computational algebra	
			Representation Theory	
8	2		Master Thesis dissertation	
4	1/2		Further activities	
6			1 module among the following	
24	2		Master Thesis dissertation	
120				

M1 78 - MATHÉMATIQUES ET APPLICATIONS PR 694 - M1 Mathématiques Appliquées - Site Evry					
Le règlement des études de l'Université Paris-Saclay rappelle que les semestres ne sont pas compensables entre eux, que la note plancher est de 7/20. Dans cette formation, toutes les UE du premier semestre sont compensables entre elles. C'est aussi le cas des UE du deuxième semestre à l'exception du stage qui n'est ni compensable ni compensant. Par défaut, les coefficients affectés à chacune des UE sont proportionnels aux ECTS correspondants.					
Nom du UE	Semestres	ECTS	Heures	Modalités de contrôle de connaissances	Coefficients
S1 - Semestre 1					
UE obligatoires					
Programmation avancée et projet	S1	4	42	Session 1 : Examens écrits + Projet - Session 2 : Examens écrits	4
Langues et formation humaines	S1	3	42	Session 1 : Examens écrits + Contrôle continu - Session 2 : Examens écrits ou oraux	3
Economie-Gestion	S1	3	42	Session 1 : Contrôles continus + projets - Pas de Session 2	3
Processus stochastique	S1	4	42	Session 1 : Examens écrits + projet - Session 2 : Examens écrits	4
Analyse des données	S1	4	42	Session 1 : Examens écrits + contrôle continu + projet - Session 2 : Examens écrits	4
12 ECTS au choix					
Recherche Opérationnelle	S1	4	42	Session 1 : Examen écrit + contrôle continu - Session 2 : Examen écrit	4
Modèles linéaires généralisés et extensions	S1	4	31,5	Session 1 : Contrôle continu et Projet - Pas de Session 2	4
Projet informatique et méthode agile	S1	4	42	Session 1 : Examens écrits + TP notés - Session 2 : Examens écrits	4
Analyse Fonctionnelle	S1	4	42	Session 1 : Contrôle continu, examen écrit ou oral - Session 2 : Examen écrit ou oral	4
Statistiques et applications	S1	4	35	Sessions 1 et 2 : Examen écrit ou oral	4
TOTAUX ECTS S1	S1	30	325,5		
S2 - Semestre 2					
UE obligatoires					
Stage entreprise ou laboratoire	S2	14	0	Mémoire et soutenance	14
Calcul Stochastique	S2	4	42	Sessions 1 et 2 : Examen écrit ou oral	4
Analyse des EDP	S2	4	42	Sessions 1 et 2 : Examen écrit ou oral	4
8 ECTS au choix					
Méthodes de simulation	S2	4	42	Session 1 : Examen écrit + Contrôle continu - Session 2 : Examen écrit ou oral	4
Instruments et Modèles financiers	S2	4	42	Sessions 1 et 2 : Examen écrit ou oral	4
Complément en Recherche opérationnelle	S2	4	42	Session 1 : Examens écrits + Projet - Session 2 : Examens écrits	4
Séries temporelles	S2	2	22	Session 1 : Examens écrits + Projet - Session 2 : Examens écrits	2
Apprentissage statistique	S2	2	22	Session 1 : Projet et Contrôle continu - Pas de Session 2	2
Statistique asymptotique	S2	2	21	Sessions 1 et 2 : Examen écrit ou oral	2
TOTAUX ECTS S2	S2	30	168		

ME 78 - MATHÉMATIQUES ET APPLICATIONS PR 770 - M2 Mathématiques Financières - Ingénierie et Finance					
Le règlement des études de l'Université Paris-Saclay rappelle que les semestres ne sont pas compensables entre eux, que la note plancher est de 7/20. Dans cette formation, toutes les UE du premier semestre sont compensables entre elles. C'est aussi le cas des UE du deuxième semestre à l'exception du stage qui n'est ni compensable ni compensant. Par défaut, les coefficients affectés à chacune des UE sont proportionnels aux ECTS correspondants.					
Nom du UE	Semestres	ECTS	Heures	Modalités de contrôle de connaissances	Coefficients
S3 - Semestre 3					
UE1 Anglais S3 (obligatoire)					
Anglais S3	S3	3	25	Examen écrit	3
UE2 Processus stochastiques (1 UE au choix)					
Calcul Stochastique	S3	7	45	Examen écrit	7
Calcul stochastique avancé et lecture d'article	S3	7	42	Rapport	7
UE3 Méthodes algorithmiques et décisionnelles pour la finance (1 UE au choix)					
Informatique pour la finance	S3	5	42	Examen écrit	5
Datamining et Apprentissage	S3	5	42	Examen écrit + Projet	5
UE4 Projet informatique (obligatoire)					
Projet	S3	4	12	Projet	4
UES Finance (7 ECTS au choix)					
Gestion des risques	S3	7	51	Examen écrit	7
Produits financiers et Technique actuarielles	S3	4	18	Examen écrit	4
Econométrie financière	S3	3	12	Projet	3
Contrôle Stochastique appliqué à la finance	S3	2	21	Projet	2
Courbe des taux	S3	3	21	Examen écrit + Projet	3
Séries temporelles à variables latentes	S3	2	21	Examen écrit+ TP noté	2
UE6 Assurance (obligatoire)					
Assurance vie, assurance non vie, produits financiers de l'assurance	S3	4	36	Projet	4
TOTAUX ECTS S3	S3	30	211		
S4 - Semestre 4					
UE7 Anglais S4					
Anglais S4	S4	3	25	Examen écrit	3
UE8 Finance numérique					
Méthodes numériques de pricing et calibration de modèles	S4	4	33	Examen écrit	4
UE9 Finance 2					
Produits dérivés de taux d'intérêt (18h), change (8h), actions et structurés (12h); trading haute fréquence (7h); risque de contrepartie (12h)	S4	5	57	Examen écrit	5
UE10 Projet en finance quantitative (1 cours parmi)					
Gestion d'actif avancée	S4	3	24	Examen ou Projet (selon les années)	3
Données Hautes Fréquence et carnets d'ordre	S4	3	24	Examen ou Projet (selon les années)	3
Datamining en finance et assurance	S4	3	33	Examen ou Projet (selon les années)	3
UE11 Projet (au choix)					
IT quant	S4	3	12	Rapport & Soutenance orale	3
Cutting edge finance	S4	3	24	Rapport & Soutenance orale	3
UE12 Stage					
Stage professionnel	s4	12	4 à 6 mois	Rapport & Soutenance orale	12
TOTAUX ECTS S4	S4	30	151		



LAUREA MAGISTRALE "MATHEMATICS" Applied mathematics

CLASSE																			
TAF	AMBITO	MIN TAF	MIN AMB																
B	Formazione teorica avanzata	35	15	1 tra i seguenti insegnamenti a scelta									36	36	54				
				MAT/01	1	1-2				6									
				MAT/02			Computational algebra												
				MAT/02			Representation theory												
				MAT/03	1	1	Differential geometry		6										
				MAT/04															
				MAT/05	1	2	Optimization		6										
				MAT/05	1	1	Partial differential equations		6										
				MAT/05	1	1	Functional analysis												
	MAT/05			Functional analysis		12													
	MAT/05			Functional analysis															
	MAT/06	1	1	Stochastic calculus		6	18	6	24										
	MAT/07	1	1	Analytical mechanics		6													
		1	1-2	1 tra i seguenti due insegnamenti															
	MAT/08			Data fitting and reconstruction		6													
	MAT/08			Data fitting and reconstruction															
	MAT/08			Numerical methods for Partial Differential Equations															
	MAT/08			Numerical methods for Partial Differential Equations															
	MAT/09																		
C	Affini	12	12		3	1-2	3 tra i seguenti insegnamenti				18	12	30						
				INF/01			Mathematical methods for computer science												
				MAT/02			Algebraic Geometry	Commutative Algebra											
				MAT/03			Algebraic Geometry	Methods of Algebraic Geometry											
				MAT/02			Homological algebra (S)												
				MAT/03			Advanced geometry												
				MAT/04															
				MAT/05			Mathematical modelling in the applied sciences (S)												
				MAT/06			Mathematical finance												
				MAT/06			Mathematical finance												
				MAT/07															
				MAT/07			Numerical modelling and optimization	Numerical optimization											
				MAT/07			Numerical modelling and optimization	Modelling seminar											
				MAT/08			Numerical methods for mathematical finance (S)												
				MAT/08			Data fitting and reconstruction												
				MAT/08			Data fitting and reconstruction												
				MAT/08			Partial differential equations												
				MAT/08			Numerical methods for Partial Differential Equations												
				MAT/08			Numerical methods for Partial Differential Equations												
				MAT/08			Foundations of data analysis												
				MAT/08			Foundations of data analysis												
				MAT/06			Statistical Learning	Statistical Learning : part 1											
				INF/01			Statistical Learning	Statistical Learning : part 2											
				MAT/09			Mathematics for decisions (S)												
				SECS-S/01															
				SECS-S/06															
				D	A scelta	8	8		1	1-2						12	12	12	12
E	Prova finale																		
F	Altre attività formative	1	1	Ulteriori conoscenze ling.															
				Abilità informatiche															
				Tirocini formativi/orient.	1 – 2				4	4									
				Altre conoscenze utili ...															
					12					102	120								