



UNIVERSITÀ DI PISA



DUAL MASTER DIPLOMA DEGREE AGREEMENT

ANNEX A

updated 2025

Pisa-Paris CURRICULUM - Plasma Physics

UNIFI STUDENT FIRST YEAR AT UNIFI

MANDATORY COURSES

FISICA DEI PLASMI (Plasma Physics)	9 CFU
FLUIDODINAMICA (se non già sostenuto nella Laurea Triennale) (Hydrodynamics, if not passed at Laurea Triennale)	6 CFU
FONDAMENTI DI INTERAZIONE RADIAZIONE MATERIA (Fundamentals of matter radiation interaction)	9 CFU
STATISTICAL PHYSICS	9 CFU

AT LEAST ONE OF THE FOLLOWING TWO

- LABORATORY OF INSTRUMENTAL SEISMOLOGY	9 CFU
- PHYSICS OF MATTER AND NANOTECHNOLOGY LABORATOR S	
	+
NUMERICAL METHODS LABORATORY	6 CFU
	15 CFU

STRONGLY SUGGESTED (AT LEAST 2 IN THE LIST)

COMPUTATIONAL HYDRODYNAMICS (at aerospace engineering)	6 CFU
MECHANICS OF GEOPHYSICAL FLUIDS	9 CFU
COMPLEX SYSTEMS	9 CFU

COURSES ON OPTION

II s OTTICA QUANTISTICA E PLASMI	(FIS 03)	9 CFU
II s ASTROFISICA GENERALE (SE NON GIÀ SOSTENUTO IN TRIENNALE)	(FIS 05)	6 CFU
II s FISICA STELLARE	(FIS 05)	6 CFU
I s FISICA TEORICA 1	(FIS 02)	9 CFU
II s DINAMICA NON LINEARE	(FIS 03)	9 CFU
II s OCEANOGRAFIA FISICA SU GRANDE SCALA	(FIS 03/06)	9 CFU
I s FISICA DELLO STATO SOLIDO	(FIS 03)	9 CFU
II s CONDENSED MATTER PHYSICS	(FIS 03)	9 CFU
I s ANALISI STATISTICA DEI DATI	(FIS 01)	9 CFU
I s MACHINE LEARNING	(INF 01) (LM INF., 654AA)	9 CFU
I s COMPUTING METHODS FOR EXPERIMENTAL PHYSICS AND DATA ANALYSIS	(FIS 01)	6 CFU
I s SISTEMI DISORDINATI FUORI EQUILIBRIO	(FIS 03)	9 CFU
II s SISTEMI COMPLESSI - DINAMICHE NEURALI	(FIS 03)	9 CFU
STATISTICAL AND MACHINE LEARNING MODELS FOR TIME SERIES ANALYSIS (SNS)		6 CFU
I s FISICA DEI BIOSISTEMI	(FIS 03)	9 CFU

TOTAL 1ST YEAR 60 CFU

II YEAR AT SU
(ALL COURSES IN ENGLISH)

COURSES OBLIGATOIRES MANDATORY COURSES	18 CFU
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OUTILS POUR LES PLASMAS ET LA FUSION (TOOLS FOR PLASMAS AND FUSION)	C1	3 CFU
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MAGNETOHYDRODYNAMIQUE (MAGNETOHYDRODYNAMICS)	C2	3 CFU
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THEORIE CINETIQUE (KINETIC THEORY)	C3	3 CFU
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ONDES ET INSTABILITES (WAVES AND INSTABILITIES)	C4	3 CFU
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INSTRUMENTATION, DIAGNOSTIC ET ANALYSE DES PLASMA (INSTRUMENTATION, DIAGNOSTIC AND PLASMA ANALYSIS)	C6	3 CFU
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PHYSIQUE ATOMIQUE MOLÉCULAIRE ET RAYONNEMENT (ATOMIQUE AND MOLECULAR PHYSICS AND RADIATION)	C7	3 CFU
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THESIS	42 CFU
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(COURSES PROPÉDEUTIQUE)
(PROPAEDEUTIC COURSES)

PLASMAS SPATIAUX (SPACE PLASMAS)	E3	3 CFU
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PLASMAS ASTROPHYSIQUES A HAUTE DENSITÉ D'ÉNERGIE (HIGH DENSITY ASTROPHYSICAL PLASMAS)	E4	3 CFU
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PREPARATION AU STAGE (MASTER THESIS INTRODUCTION)		6 CFU
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STAGE (STAGE)		30 CFU
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TOTAL 2ND YEAR	60 CFU
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TOTAL MASTER	120 CFU
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FRENCH STUDENT

FIRST YEAR AT SU

MANDATORY COURSES (FIRST SEMESTER) 15 CFU

- MECANIQUE QUANTIQUE : DES CONCEPTS A L'EXPERIENCE 6 CFU
- PHYSIQUE STATISTIQUE, CONCEPTS ET FONDEMENTS 9 CFU

MANDATORY COURSES (FIRST SEMESTER) 6 CFU

AT LEAST ONE FOR EACH OF THE FOLLOWING GROUP

- PHYSIQUE NUMERIQUE ET INFORMATIQUES 6 CFU
- PHYSIQUE NUMERIQUE (PROJET) 6 CFU

COURSES ON OPTION 12 CFU

- PLASMAS : BASES PHYSIQUES 3 CFU
- THEORIE CLASSIQUE DES CHAMPS 3 CFU
- PHYSIQUE EXPERIMENTALE I 3 CFU
- INSERTION PROFESSIONNEL 3 CFU

MANDATORY COURSES (SECONDE SEMESTER) 21 CFU

- PHYSIQUE ATOMIQUE ET MOLECULAIRE 6 CFU
- PHYSIQUE EXPERIMENTALE II 3 CFU
- COURS D'ANGLAIS (ENGLISH COURSE) 3 CFU
- STAGE 9 CFU

COURSES ON OPTION 9 CFU

- PLASMAS : APPLICATIONS 3 CFU
- METHODES NUMERIQUES ET CALCULS SCIENTIFIQUES 3 CFU
- PHYSIQUE DES TRANSPORTS 3 CFU
- ASTROPHYSIQUE ET COSMOLOGIE 3 CFU

TOTAL 1ST YEAR 60 CFU

SECOND YEAR AT UNIP

MANDATORY COURSES 9 CFU

- PLASMA PHYSICS 9 CFU

COURSES ON OPTION

AT LEAST ONE OF THE FOLLOWING

- INTRODUCTION TO THE
- PHYSICS OF CONTROLLED NUCLEAR FUSION 6 CFU
- OTTICA QUANTISTICA E PLASMI 9 CFU
- COMPUTATIONAL HYDRODYNAMICS (at aerospace engineering) 6 CFU

MASTER THESIS/STAGE 45 CFU

TOTAL 2ND YEAR 60 CFU

TOTAL MASTER 120 CFU

Pisa-Paris CURRICULUM – Fundamental Interactions

UNIFI STUDENT I YEAR AT UNIFI

MANDATORY COURSES

Is [305BB] FUNDAMENTAL INTERACTIONS FIS/04	09 CFU
A [413BB] FUNDAMENTAL INTERACTIONS LABORATORY S FIS/01	09 CFU

EXPERIMENTAL, NUCLEAR AND SUBNUCLEAR PHYSICS (GROUP 1)

(AT LEAST ONE OF THE FOLLOWING COURSE)

II s [373BB] PARTICLE PHYSICS S FIS/04	06 CFU
II s [0047B] PHYSICS AND DETECTORS OF GRAVITATIONAL WAVES S FIS/01	06 CFU
II s [0007B] QUANTUM TECHNOLOGIES FOR FUNDAMENTAL INTERACTION PHYSICS FIS/01	09 CFU

EXPERIMENTAL, NUCLEAR AND SUBNUCLEAR PHYSICS (GROUP 2)

(AT LEAST ONE OF THE FOLLOWING COURSE)

II s [217BB] ACCELERATOR PHYSICS FIS/04	09 CFU
Is [360BB] COMPUTING METHODS FOR EXPERIMENTAL PHYSICS AND DATA ANALYSIS FIS/01	09 CFU
II s [380BB] INSTRUMENTATION FOR FUNDAMENTAL INTERACTIONS PHYSICS FIS/01	09 CFU
Is [193BB] STATISTICAL DATA ANALYSIS FIS/01	09 CFU

THEORETICAL PHYSICS GROUP

(AT LEAST ONE OF THE FOLLOWING COURSE)

Is [228BB] GENERAL RELATIVITY FIS/02	09 CFU
Is [213BB] QUANTUM FIELD THEORY FIS/02. (WAS THEORETICAL PHYSICS)	09 CFU

ASTROPHYSICS GROUP

(AT LEAST ONE OF THE FOLLOWING COURSE)

II s [063BB] ASTROPARTICLE PHYSICS S FIS/05	06 CFU
II s [368BB] ASTROPHYSICS FIS/05	06 CFU
II s [275BB] COSMOLOGY OF THE EARLY UNIVERSE S FIS/05	06 CFU

TOTAL

48-51 CFU

OPTIONAL COURSES

9-12 CFU

(CAN ALSO INCLUDE THE NOT CHOSEN COURSES FROM THE PREVIOUS LIST)

Is [306BB] EXPERIMENTAL METHODS FOR ASTROPARTICLE PHYSICS FIS/01	09 CFU
Is [304BB] FUNDAMENTALS OF LIGHT MATTER INTERACTION FIS/03	09 CFU
Is [385BB] INTRODUCTION TO NEUTRINO PHYSICS FIS/04	03 CFU
Is [206BB] NUCLEAR PHYSICS FIS/04	09 CFU
Is [427BB] PARTICLE DARK MATTER FIS/01	06 CFU
Is [1095I] RADIATION PROTECTION ING-IND/20	06 CFU
Is [338BB] SIGNAL PROCESSING FOR PHYSICS FIS/01	06 CFU
Is [204BB] SOLID STATE PHYSICS FIS/03	09 CFU
Is [207BB] STATISTICAL PHYSICS FIS/02	09 CFU
II s [214BB] ADVANCED QUANTUM FIELD THEORY FIS/02	09 CFU
II s [0008B] BIOPHYSICS OF EFLASH THERAPY FIS/07	09 CFU
II s [0035B] DESIGN OF DIGITAL SYSTEMS FOR RADIATION DETECTION FIS/07	06 CFU
II s [0009B] DETECTION TECHNIQUES: FROM LAB TO SPACE FIS/01	09 CFU
II s [308BB] DISCRETE SYMMETRIES FIS/04	06 CFU
II s [198BB] DOSIMETRY FIS/07	06 CFU
II s [080BB] ELECTRONICS AND SENSORS FIS/07	06 CFU

II s [0004B] FLEXIBLE AND NANO-ELECTRONICS FIS/03	09 CFU
II s [201BB] HADRON COLLIDER PHYSICS FIS/04	09 CFU
II s [371BB] HADRON COLLIDER PHYSICS S FIS/04	06 CFU
II s [185BB] MONTECARLO METHODS IN EXPERIMENTAL PHYSICS FIS/01	06 CFU
II s [302BB] PARTICLE PHYSICS FIS/04	09 CFU
II s [0046B] PHYSICS AND DETECTORS OF GRAVITATIONAL WAVES FIS/01	09 CFU
II s [378BB] RECENT HIGHLIGHTS IN FUNDAMENTAL INTERACTIONS FIS/04	03 CFU
A [326BB] COMPUTATIONAL PHYSICS LABORATORY FIS/01	09 CFU
A [SNS-SMB] STANDARD MODEL AND BEYOND FIS/02	06 CFU

TOTAL 1ST YEAR

60 CFU

II YEAR AT SU (ALL COURSES IN ENGLISH)

MANDATORY COURSES **9 CFU**

EXPERIMENTAL PROJECT (COUNTS AS STAGE/THESIS PREPARATION - THESIS PART 1)	6 CFU
LA PHYSIQUE DU DETECTORS (DETECTOR PHYSICS)	3 CFU

COURSES ON OPTION **21 CFU**

**AT LEAST THREE OF THE FOLLOWING GROUP
(ONE OF THESE IS COUNTED AS THESIS PREPARATION - PART 2)**

THEORIE QUANTIQUE DE CHAMPS (QUANTUM FIELD THEORY)	6 CFU
PARTICULES ET SYMETRIES (PARTICLES AND SYMMETRIES)	6 CFU
COSMOLOGIE ET ASTROPARTICULES (COSMOLOGY AND ASTROPARTICLES)	6 CFU
DES NOYAUX AUX ETOILES (FROM NUCLEUS TO STARS)	6 CFU

AT LEAST ONE OF THE FOLLOWING GROUP

RELATIVITE GENERALE (GENERAL RELATIVITY)	3 CFU
PHYSIQUE DES ACCELERATEURS (ACCELERATOR PHYSICS)	3 CFU

THESIS - PART 3 **30 CFU**

(PROPAEDEUTIC COURSES)	
NUMERICAL PROJECT	3 CFU
ADVANCED LECTURES	3 CFU
PREPARATION AU STAGE/MASTER THESIS	24 CFU

TOTAL 2ND YEAR **60 CFU**

TOTAL MASTER **120 CFU**

FRENCH STUDENT

FIRST YEAR AT SU

MANDATORY COURSES 51 CFU

ADVANCED QUANTUM MECHANICS (FIS 02)	9 CFU
STATISTICAL PHYSICS (FIS 02)	9 CFU
NUCLEAR AND PARTICLE PHYSICS (FIS 04)	6 CFU
NUMERICAL METHODS FOR PHYSICS (FIS 01)	6 CFU
ASTROPHYSICS AND COSMOLOGY (FIS 05)	6 CFU
FRENCH FOREIGN LANGUAGE (ENGLISH)	3 CFU
LABORATORY (FIS 01)	3 CFU
INTERNSHIP (3 MONTHS)	9 CFU

COURSES ON OPTION

AT LEAST ONE OF THE FOLLOWING GROUP 3 CFU

CLASSICAL FIELD THEORY	3 CFU
TIME AND RELATIVITY	3 CFU
INTRODUCTION TO PLASMA PHYSICS	3 CFU

AT LEAST ONE OF THE FOLLOWING GROUP 6 CFU

ATOM AND MOLECULAR PHYSICS	6 CFU
CONDENSED MATTER	6 CFU

TOTAL 1ST YEAR 60 CFU

SECOND YEAR AT UNIFI

COURSES ON OPTION 15/18 CFU

COURSES TO BE CHOSEN IN THE FOLLOWING LIST 15/18 CFU

Is [360BB] COMPUTING METHODS FOR EXPERIMENTAL PHYSICS AND DATA ANALYSIS FIS/01	09 CFU
Is [306BB] EXPERIMENTAL METHODS FOR ASTROPARTICLE PHYSICS FIS/01	09 CFU
Is [304BB] FUNDAMENTALS OF LIGHT MATTER INTERACTION FIS/03	09 CFU
Is [305BB] FUNDAMENTAL INTERACTIONS FIS/04	09 CFU
Is [228BB] GENERAL RELATIVITY FIS/02	09 CFU
Is [385BB] INTRODUCTION TO NEUTRINO PHYSICS FIS/04	03 CFU
Is [206BB] NUCLEAR PHYSICS FIS/04	09 CFU
Is [427BB] PARTICLE DARK MATTER FIS/01	06 CFU
Is [1095I] RADIATION PROTECTION ING-IND/20	06 CFU
Is [338BB] SIGNAL PROCESSING FOR PHYSICS FIS/01	06 CFU
Is [204BB] SOLID STATE PHYSICS FIS/03	09 CFU
Is [207BB] STATISTICAL PHYSICS FIS/02	09 CFU

I s [193BB] STATISTICAL DATA ANALYSIS FIS/01	09 CFU
II s [217BB] ACCELERATOR PHYSICS FIS/04	09 CFU
II s [275BB] COSMOLOGY OF THE EARLY UNIVERSE S FIS/05	06 CFU
II s [214BB] ADVANCED QUANTUM FIELD THEORY FIS/02	09 CFU
II s [0008B] BIOPHYSICS OF EFLASH THERAPY FIS/07	09 CFU
II s [0035B] DESIGN OF DIGITAL SYSTEMS FOR RADIATION DETECTION FIS/07	06 CFU
II s [0009B] DETECTION TECHNIQUES: FROM LAB TO SPACE FIS/01	09 CFU
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II s [201BB] HADRON COLLIDER PHYSICS FIS/04	09 CFU
II s [371BB] HADRON COLLIDER PHYSICS S FIS/04	06 CFU
II s [380BB] INSTRUMENTATION FOR FUNDAMENTAL INTERACTIONS PHYSICS FIS/01	09 CFU
II s [185BB] MONTECARLO METHODS IN EXPERIMENTAL PHYSICS FIS/01	06 CFU
II s [373BB] PARTICLE PHYSICS S FIS/04	06 CFU
II s [302BB] PARTICLE PHYSICS FIS/04	09 CFU
II s [0046B] PHYSICS AND DETECTORS OF GRAVITATIONAL WAVES FIS/01	09 CFU
II s [378BB] RECENT HIGHLIGHTS IN FUNDAMENTAL INTERACTIONS FIS/04	03 CFU
A [326BB] COMPUTATIONAL PHYSICS LABORATORY FIS/01	09 CFU
A [SNS-SMB] STANDARD MODEL AND BEYOND FIS/02	06 CFU
MASTER THESIS/STAGE	45/42 CFU
TOTAL 2ND YEAR	60 CFU
TOTAL MASTER	120 CFU