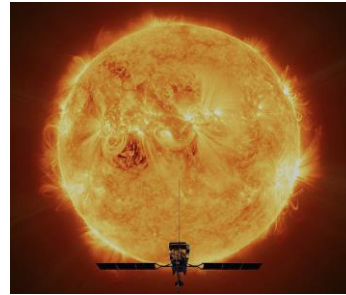




Pisa-Paris CURRICULUM Plasma Physics



(Structure of Matter)

UNIPI STUDENT

FIRST YEAR AT UNIPI

CORSI OBBLIGATORI - MANDATORY COURSES

18/24 CFU

FONDAMENTI DI INTERAZIONE RADIAZIONE MATERIA
(Fundamentals of matter radiation interaction)

9 CFU

□

FISICA DEI PLASMI
(Plasma Physics)

9 CFU

□

FLUIDODINAMICA (se non già sostenuto nella Laurea Triennale)
(Hydrodynamics, if not passed at Laurea Triennale)

6 CFU

□

CORSI DI CUI ALMENO UNO PER GRUPPO OBBLIGATORIO AT LEAST ONE BY GROUP MANDATORY COURSE

18 CFU

1a. ANALISI STATISTICA DEI DATI
(Statistical analysis of data)

1b. LABORATORIO DI OTTICA QUANTISTICA A
(Quantum optics laboratory)

9 CFU

□

1c. METODI NUMERICI PER LA FISICA
(Numerical Methods for Physics)

| | | |
|--|-------|--------------------------|
| 2a. FISICA STATISTICA (Statistical Physics) | | |
| 2b. FISICA TEORICA 1 (Theoretical Physics) | 9 CFU | <input type="checkbox"/> |

CORSI OPZIONALI - COURSES ON OPTION

24/18 CFU

Fortemente suggeriti (almeno uno) - strongly suggested (at least one)

| | | |
|--|-------|--------------------------|
| - PROCESSI ASTROFISICI (Astrophysics Processes) | 9 CFU | <input type="checkbox"/> |
| - FISICA STELLARE A (Stellar Physics) | 6 CFU | <input type="checkbox"/> |
| - ASTROFISICA EXTRAGALATTICA E COSMOLOGIA (Extragalactic Astrophysics and Cosmology) | 6 CFU | <input type="checkbox"/> |
| - ASTROFISICA GENERALE (se non già sostenuto nella triennale) (General Astrophysics, if not passed at Laurea Triennale) | 6 CFU | <input type="checkbox"/> |

Fortemente suggeriti (almeno uno) - strongly suggested (at least one)

| | | |
|---|-------|--------------------------|
| - SISTEMI COMPLESSI (Complex Systems) | 9 CFU | <input type="checkbox"/> |
| - FLUIDODINAMICA COMPUTAZIONALE (ING. AEROSPAZIALE) (Computational Hydrodynamics – at Aerospace Engineering) | 6 CFU | <input type="checkbox"/> |

Altri - others

| | | |
|---|-------|--------------------------|
| RELATIVITA` GENERALE (General Relativity) | 9 CFU | <input type="checkbox"/> |
| FISICA DELLO STATO SOLIDO (Solid State Physics) | 9 CFU | <input type="checkbox"/> |
| LASER A STATO SOLIDO (Solid State Laser) | 3 CFU | <input type="checkbox"/> |
| ALGORITMI DI SPETTROSCOPIA (Spectroscopy Algorithms) | 3 CFU | <input type="checkbox"/> |
| | CFU | <input type="checkbox"/> |

TOTAL **60 CFU**
II YEAR AT SU

MANDATORY COURSES **18 ECTS**

| | | | |
|--|-----|-------|---|
| OUTILS POUR LES PLASMAS ET LA FUSION (tools for plasmas and fusion) | TC1 | 3 CFU | □ |
| MAGNETOHYDRODYNAMIQUE (MagnetoHydrodynamics) | TC2 | 3 CFU | □ |
| THEORIE CINETIQUE (Kinetic Theory) | TC3 | 3 CFU | □ |
| ONDES ET INSTABILITES (Waves and Instabilities) | TC4 | 3 CFU | □ |
| INSTRUMENTATION, DIAGNOSTIC ET ANALYSE DES PLASMA (Instrumentation, Diagnostic and Plasma Analysis) | TC6 | 3 CFU | □ |
| PHYSIQUE ATOMIQUE MOLÉCULAIRE ET RAYONNEMENT (Atomique and molecular physics and radiation) | TC7 | 3 CFU | □ |

THESIS **42 ECTS**

(COURSES PROPÉDEUTIQUE)
(PROPAEDEUTIC COURSES)

| | | | |
|--|----|--------|---|
| PLASMAS SPATIAUX (Space Plasmas) | O3 | 3 CFU | □ |
| PLASMAS ASTROPHYSIQUES A HAUTE DENSITÉ D'ÉNERGIE (high density Astrophysical Plasmas) | O4 | 3 CFU | □ |
| PREPARATION AU STAGE (METHODES NUMERIQUES ET SIMULATIONS) | | 6 CFU | □ |
| STAGE | | 30 CFU | □ |

TOTAL **60 ECTS**

FRENCH STUDENT

FIRST YEAR AT SU

MANDATORY COURSES (first semester)

AT LEAST ONE FOR EACH OF THE FOLLOWING 3 GROUPS

18 CFU

| | | |
|---|-------|--------------------------|
| - mecanique quantique : des concepts à l'expérience | 6 CFU | <input type="checkbox"/> |
| - mecanique quantique : bases et applications | 6 CFU | <input type="checkbox"/> |
| - Physique statistique, des concepts à l'expérience | 6 CFU | <input type="checkbox"/> |
| - Physique statistique, bases et applications | 6 CFU | <input type="checkbox"/> |
| - physique numérique et informatiques | 6 CFU | <input type="checkbox"/> |
| - Physique numérique (projet) | 6 CFU | <input type="checkbox"/> |

COURSES ON OPTION

12 CFU

| | | |
|------------------------------|-------|--------------------------|
| Plasmas: bases physiques | 3 CFU | <input type="checkbox"/> |
| théorie classique des champs | 3 CFU | <input type="checkbox"/> |
| physique expérimentale I | 3 CFU | <input type="checkbox"/> |
| insertion professionnel | 3 CFU | <input type="checkbox"/> |

MANDATORY COURSES (Seconde semestre)

21 CFU

| | | |
|----------------------------------|-------|--------------------------|
| physique atomique et moléculaire | 6 CFU | <input type="checkbox"/> |
| physique experimentale II | 3 CFU | <input type="checkbox"/> |
| cours d'anglais (english course) | 3 CFU | <input type="checkbox"/> |
| Stage | 9 CFU | <input type="checkbox"/> |

COURSES ON OPTION

9 CFU

| | | |
|--|-------|--------------------------|
| Plasmas: applications | 3 CFU | <input type="checkbox"/> |
| Méthodes Numériques et Calculs Scientifiques | 3 CFU | <input type="checkbox"/> |
| Physique des Transports | 3 CFU | <input type="checkbox"/> |

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|-----------------------------|-------|---|
| Astrophysique et cosmologie | 3 CFU | □ |
|-----------------------------|-------|---|

SECOND YEAR AT UNIPI

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|--|--------------|---|
| MANDATORY COURSES | 9 CFU | |
| FISICA DEI PLASMI (FIS 05) (Plasma Physics) | 9 CFU | □ |

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|--|--------------|--|
| COURSES ON OPTION AT LEAST ONE OF THE FOLLOWING | 6 CFU | |
|--|--------------|--|

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|---|-------|---|
| - PLASMI TEORIA CINETICA (Plasma Kinetic Theory) | 6 CFU | □ |
|---|-------|---|

| | | |
|---|-------|---|
| - ELETTRODINAMICA DEI MEZZI CONTINUI (Electrodynamics of continuous media) | 6 CFU | □ |
|---|-------|---|

| | | |
|--|-------|---|
| - OTTICA QUANTISTICA E PLASMI (Quantum optics and Plasma) | 6 CFU | □ |
|--|-------|---|

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|---|-------|---|
| - FLUIDODINAMICA COMPUTAZIONALE (ING. AEROSPAZIALE) (Computational Hydrodynamics – at Aerospace Engineering) | 6 CFU | □ |
|---|-------|---|

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|-------|-----|---|
| | CFU | □ |
|-------|-----|---|

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|----------------------------|---------------|--|
| MASTER THESIS/STAGE | 45 CFU | |
|----------------------------|---------------|--|

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| TOTAL | 120 CFU | |
|--------------|----------------|--|

Pisa-Paris CURRICULUM Fundamental Interactions

UNIPI STUDENT

FIRST YEAR AT UNIPI

| | | |
|---|---------------|--------------------------|
| MANDATORY COURSES | 27 CFU | |
| FISICA TEORICA 1 (FIS 02) (THEORETICAL PHYSICS - PART 1) | 9 CFU | <input type="checkbox"/> |
| LABORATORIO DI INTERAZIONI FONDAMENTALI B/ Modulo A (FIS 01) (FUNDAMENTAL INTERACTIONS LABORATORY - part 1) | 9 CFU | <input type="checkbox"/> |
| INTERAZIONI FONDAMENTALI (FIS 04) (FUNDAMENTAL INTERACTIONS) | 9 CFU | <input type="checkbox"/> |

| | | |
|---|--------------|--------------------------|
| OPTIONAL COURSES AT LEAST ONE OF THE FOLLOWING | 6 CFU | |
| - ASTROFISICA GENERALE (FIS 05) (se non gia` seguito nel percorso triennale) (ASTROPHYSICS) | 6 CFU | <input type="checkbox"/> |
| - ASTROPARTICELLE A (FIS 05) (ASTROPARTICLE - SHORT VERSION) | 6 CFU | <input type="checkbox"/> |

| | | |
|--|---------------|--------------------------|
| OPTIONAL COURSES | 27 CFU | |
| CORSI IN ALTERNATIVA, FRA QUELLI NON SCELTI SOPRA O NELLA LISTA SEGUENTE | | |
| COURSES TO BE CHOSEN IN THE FOLLOWING LIST OR AMONG THE ONES NOT CHOSEN ABOVE | | |
| RELATIVITA` GENERALE (FIS 02) (GENERAL RELATIVITY) | 9 CFU | <input type="checkbox"/> |
| COSMOLOGIA DEL PRIMO UNIVERSO S (FIS 05) | 6 CFU | <input type="checkbox"/> |

| | | |
|---|-------|---|
| (EARLY UNIVERSE COSMOLOGY) | | |
| FISICA DELLE PARTICELLE S (FIS 04) (PARTICLE PHYSICS - SHORT VERSION) | 6 CFU | □ |
| FISICA DELLE PARTICELLE S (FIS 04) (PARTICLE PHYSICS – FULL VERSION) | 9 CFU | □ |
| FISICA DELLE ONDE GRAVITAZIONALI A (FIS 01) (GRAVITATIONAL WAVES PHYSICS - SHORT VERSION) | 6 CFU | □ |
| REAZIONI NUCLEARI DI INTERESSE ASTROFISICO S (FIS 04) (LOW ENERGY NUCLEAR REACTIONS - SHORT VERSION) | 6 CFU | □ |
| INSTRUMENTATION FOR FUNDAMENTAL INTERACTIONS PHYSICS (FIS 01) | 9 CFU | □ |
| ANALISI STATISTICA DEI DATI (FIS 01) (STATISTICS ANALYSIS OF EXP DATA) | 9 CFU | □ |
| MACCHINE ACCELERATRICI (FIS 04) (ACCELERATORS) | 9 CFU | □ |
| COMPUTING METHODS FOR EXPERIMENTAL PHYSICS AND DATA ANALYSIS (FIS 01) | 9 CFU | □ |
| RECENT HIGHLIGHTS IN FUNDAMENTAL INTERACTIONS (FIS 01) | 3 CFU | □ |
| SIMMETRIE DISCRETE (FIS/04) (DISCRETE SIMMETRIES) | 6 CFU | □ |
| FISICA DELLE ONDE GRAVITAZIONALI (FIS 01) (GRAVITATIONAL WAVES PHYSICS - FULL VERSION) | 9 CFU | □ |
| FISICA TEORICA 2 (FIS 02) (THEORETICAL PHYSICS - PART 2) | 9 CFU | □ |
| FISICA AI COLLISIONATORI ADRONICI (FIS 04) (HADRONIC COLLIDER PHYSICS) | 9 CFU | □ |
| FISICA AI COLLISIONATORI ADRONICI S (FIS 04) (HADRONIC COLLIDER PHYSICS - SHORT VERSION) | 6 CFU | □ |
| FONDAMENTI DI INTERAZIONE RADIAZIONE MATERIA (FIS 03) (FUNDAMENTALS OF PHOTON-MATTER INTERACTION) | 9 CFU | □ |
| FISICA DELLO STATO SOLIDO (FIS 03) (SOLID STATE PHYSICS) | 9 CFU | □ |
| LABORATORIO DI INTERAZIONI FONDAMENTALI B/ Modulo B (FIS 01) | 6 CFU | □ |
| Completion of ASTROPARTICELLE A (FIS 05) (ASTROPARTICLE - LONG VERSION) | 3 CFU | □ |
| CROMODINAMICA QUANTISTICA (FIS 02) (QUANTUM CHROMODYNAMICS) | 9 CFU | □ |

TOTAL 1st YEAR

60 CFU

II YEAR AT SU

| | | |
|---|----------------|---|
| 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 | <input type="checkbox"/> |
| STATISTICAL PHYSICS (FIS 02) | 9 CFU | <input type="checkbox"/> |
| NUCLEAR AND PARTICLE PHYSICS (FIS 04) | 6 CFU | <input type="checkbox"/> |
| NUMERICAL METHODS FOR PHYSICS (FIS 01) | 6 CFU | <input type="checkbox"/> |
| ASTROPHYSICS AND COSMOLOGY (FIS 05) | 6 CFU | <input type="checkbox"/> |
| FRENCH FOREIGN LANGUAGE (ENGLISH) | 3 CFU | <input type="checkbox"/> |
| LABORATORY (FIS 01) | 3 CFU | <input type="checkbox"/> |
| INTERNSHIP (3 MONTHS) | 9 CFU | <input type="checkbox"/> |

COURSES ON OPTION

| | | |
|--|--------------|--------------------------|
| AT LEAST ONE OF THE FOLLOWING GROUP | 3 CFU | |
| CLASSICAL FIELD THEORY | 3 CFU | <input type="checkbox"/> |
| TIME AND RELATIVITY | 3 CFU | <input type="checkbox"/> |
| INTRODUCTION TO PLASMA PHYSICS | 3 CFU | <input type="checkbox"/> |

| | | |
|--|--------------|--------------------------|
| AT LEAST ONE OF THE FOLLOWING GROUP | 6 CFU | |
| ATOM AND MOLECULAR PHYSICS | 6 CFU | <input type="checkbox"/> |
| CONDENSED MATTER | 6 CFU | <input type="checkbox"/> |

TOTAL 1st YEAR **60 CFU**

SECOND YEAR AT UNIPI

COURSES ON OPTION **15/18 CFU**

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

| | | |
|--|---------|---|
| RELATIVITA` GENERALE (FIS 02) (GENERAL RELATIVITY) | 9 CFU | □ |
| COSMOLOGIA DEL PRIMO UNIVERSO S (FIS 05) (EARLY UNIVERSE COSMOLOGY) | 6 CFU | □ |
| FISICA DELLE PARTICELLE S (FIS 04) (PARTICLE PHYSICS - SHORT VERSION) | 6 CFU | □ |
| FISICA DELLE PARTICELLE S (FIS 04) (PARTICLE PHYSICS - FULL VERSION) | 9 CFU | □ |
| INTERAZIONI FONDAMENTALI (FIS 04) (FUNDAMENTAL INTERACTIONS) | 9 CFU | □ |
| FISICA DELLE ONDE GRAVITAZIONALI A (FIS 01) (GRAVITATIONAL WAVES PHYSICS - SHORT VERSION) | 6 CFU | □ |
| REAZIONI NUCLEARI DI INTERESSE ASTROFISICO S (FIS 04) (LOW ENERGY NUCLEAR REACTIONS - SHORT VERSION) | 6 CFU | □ |
| INSTRUMENTATION FOR FUNDAMENTAL INTERACTIONS PHYSICS (FIS 01) | 9 CFU | □ |
| ANALISI STATISTICA DEI DATI (FIS 01) (STATISTICS ANALYSIS OF EXP DATA) | 9 CFU | |
| MACCHINE ACCELERATRICI (FIS 04) (ACCELERATORS) | 9 CFU | □ |
| COMPUTING METHODS FOR EXPERIMENTAL PHYSICS AND DATA ANALYSIS (FIS 01) | 9 CFU | □ |
| RECENT HIGHLIGHTS IN FUNDAMENTAL INTERACTIONS (FIS 01) | 3 CFU | □ |
| SIMMETRIE DISCRETE (FIS/04) (DISCRETE SIMMETRIES) | 6 CFU | □ |
| FISICA DELLE ONDE GRAVITAZIONALI (FIS 01) (GRAVITATIONAL WAVES PHYSICS - FULL VERSION) | 9 CFU | □ |
| FISICA TEORICA 2 (FIS 02) (THEORETICAL PHYSICS - PART 2) | 9 CFU | □ |
| FISICA AI COLLISIONATORI ADRONICI (FIS 01) (HADRONIC COLLIDER PHYSICS) | 6/9 CFU | □ |
| FONDAMENTI DI INTERAZIONE RADIAZIONE MATERIA (FIS 03) (FUNDAMENTS OF PHOTON INTERACTION WITH MATTERS) | 9 CFU | □ |
| FISICA DELLO STATO SOLIDO (FIS 03) (SOLID STATE PHYSICS) | 9 CFU | □ |

MASTER THESIS/STAGE

45/42 CFU

TOTAL 2nd YEAR

60 CFU

TOTAL MASTER

120 CFU