## Studies Plan

# Ingénierie Physique 2023-24

**Block "Projects & SHS"**

| | Courses | | | | Master 1 | | | Master 2 | | | Exam Session | Exam | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Language | Code | Section | Teacher | Specialization | l | e | p | l | e | p | | | |
| | **Physics project I** | | | | | | | | | | | | |
| | *PHYS-421* | *PH* | *Profs divers* | | | | 8h | | | | *Win* | *During the semester* | *8* |
| | **Physics project II** | | | | | | | | | | | | |
| | *PHYS-422* | *PH* | *Profs divers* | | | | | | | 8h | *Sum* | *During the semester* | *8* |
| | **HSS : Introduction to project** | | | | | | | | | | | | |
| | | *SHS* | | | | | | | | | *Win* | | *3* |
| | **HSS : Project** | | | | | | | | | | | | |
| | | *SHS* | | | | | | | | | *Sum* | | *3* |

**Engineering options**

| | Courses | | | | Master 1 | | | Master 2 | | | Exam Session | Exam | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Language | Code | Section | Teacher | Specialization | l | e | p | l | e | p | | | |
| | **Attosecond radiation sources** | | | | | | | | | | | | |
| *E* | *PHYS-761* | *EDPY* | *Carbone Invited professor(s) Puppin* | | 2h | 2h | | | | | | *Oral* | *4* |
| | **Computational quantum physics** | | | | | | | | | | | | |
| *E* | *PHYS-463* | *PH* | *Carleo* | | | | | 2h | 2h | | *Sum* | *Oral* | *4* |
| | **Computer simulation of physical systems I** | | | | | | | | | | | | |
| *E* | *PHYS-403* | *PH* | *Pasquarello* | | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Electron microscopy: advanced methods** | | | | | | | | | | | | |
| *E* | *MSE-450* | *MX* | *Alexander* | | | | | 2h | 1h | | *Sum* | *Oral* | *3* |
| | **Experimental methods in physics** | | | | | | | | | | | | |
| *E* | *PHYS-405* | *PH* | *Cantoni Dwir* | | 2h | 1h | | | | | *Win* | *Oral* | *3* |
| | **Frontiers in nanosciences** | | | | | | | | | | | | |
| *E* | *PHYS-407* | *PH* | *Kern Pivetta Rusponi* | | 2h | 1h | | | | | *Win* | *Oral* | *3* |
| | **Fundamentals of biomedical imaging** | | | | | | | | | | | | |
| *E* | *PHYS-438* | *PH* | *Gruetter* | | | | | 2h | 2h | | *Sum* | *Written* | *4* |
| | **Introduction to particle accelerators** | | | | | | | | | | | | |
| *E* | *PHYS-448* | *PH* | *Seidel* | | 2h | 2h | | | | | *Win* | *Written* | *4* |
| | **Lasers: theory and modern applications** | | | | | | | | | | | | |
| *E* | *MICRO-422* | *MT* | *Kippenberg Moser* | | 3h | 1h | | | | | *Win* | *Written* | *4* |
| | **Machine learning for physicists** | | | | | | | | | | | | |
| *E* | *PHYS-467* | *PH* | *Zdeborová* | | 2h | 2h | | | | | *Win* | *Written* | *4* |
| | **Modeling and design of experiments** | | | | | | | | | | | | |
| *E* | *PHYS-442* | *PH* | *Fuerbringer* | | | | | 2h | | 2h | *Sum* | *Oral* | *4* |
| | **Nonlinear dynamics, chaos and complex systems** | | | | | | | | | | | | |
| *E* | *PHYS-460* | *PH* | *Février* | | | | | 3h | 2h | | *Sum* | *Oral* | *6* |
| | **Nonlinear optics for quantum technologies** | | | | | | | | | | | | |
| *E* | *PHYS-470* | *PH* | | | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Nuclear fusion and plasma physics** | | | | | | | | | | | | |
| *E* | *PHYS-445* | *PH* | *Fasoli* | | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Nuclear interaction : from reactors to stars** | | | | | | | | | | | | |
| *E* | *PHYS-461* | *PH* | *Rochman* | | 2h | 2h | | | | | *Win* | *Written* | *4* |
| | **Particle detection** | | | | | | | | | | | | |
| *E* | *PHYS-440* | *PH* | *Haefeli* | | 2h | 2h | | | | | *Win* | *During the semester* | *4* |
| | **Physics of life** | | | | | | | | | | | | |
| *E* | *PHYS-468* | *PH* | *Stahlberg* | | | | | 2h | 2h | | *Sum* | *Written* | *4* |
| | **Physics of materials** | | | | | | | | | | | | |
| *E* | *PHYS-307* | *PH* | *La Grange* | | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Physics of photonic semiconductor devices** | | | | | | | | | | | | |
| *E* | *PHYS-434* | *PH* | *Grandjean* | | | | | 2h | 2h | | *Sum* | *Oral* | *4* |



**C : Courses, E : Exercice, P : Pratic courses, * : option courses / F : French courses, D : Deutsch courses, E : English Courses / Sum : Summer, Win : Winter**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Plasma II** | | | | | | | | | | | |
| *E* | *PHYS-424* | *PH* | *Reimerdes* | | | 2h | 2h | | *Sum* | *Oral* | *6* | |
| | **Quantum optics and quantum information** | | | | | | | | | | | |
| *E* | *PHYS-454* | *PH* | *Brantut* | | | 2h | 2h | | *Sum* | *Written* | *6* | |
| | **Radiation biology, protection and applications** | | | | | | | | | | | |
| *E* | *PHYS-450* | *PH* | *Damet Grilj Pakari* | 2h | 1h | | | | *Win* | *Written* | *4* | |
| | **Radiation detection** | | | | | | | | | | | |
| *E* | *PHYS-452* | *PH* | *Lamirand* | 2h | 1h | | | | *Win* | *Oral* | *3* | |
| | **Selected topics in nuclear and particle physics** | | | | | | | | | | | |
| *E* | *PHYS-400* | *PH* | *Blanc* | | | 2h | 2h | | *Sum* | *Oral* | *4* | |
| | **Semiconductor physics and light-matter interaction** | | | | | | | | | | | |
| *E* | *PHYS-433* | *PH* | *Butté* | 2h | 2h | | | | *Win* | *Written* | *4* | |
| | **Solid state systems for quantum information** | | | | | | | | | | | |
| *E* | *PHYS-464* | *PH* | *Scarlino* | | | 2h | 2h | | *Sum* | *Oral* | *4* | |
| | **Topics in biophysics and physical biology** | | | | | | | | | | | |
| *E* | *PHYS-466* | *PH* | *Manley* | | | 2h | 1h | | *Sum* | *During the semester* | *3* | |

**Internship**

| | ***Courses*** | | | ***Master 1*** | | | ***Master 2*** | | | ***MP Autumn*** | | | ***MP Spring*** | | | ***Exam Session*** | ***Exam*** | ***Credit*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Language* | *Code* | *Section* | *Teacher* | *Specialization* | | | *l* | *e* | *p* | *l* | *e* | *p* | *l* | *e* | *p* | | | |
| | **Engineering internship (master in Physics Engineering)** | | | | | | | | | | | | | | | | | |
| *F* | *PHYS-596* | *PH* | *Profs divers* | | | 680h | | | 680h | | | 680h | | | 680h | *Sum Win* | *During the semester* | *30* |

**Master project**

| | ***Courses*** | | | ***MP Autumn*** | | | ***MP Spring*** | | | ***Exam Session*** | ***Exam*** | ***Credit*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Language* | *Code* | *Section* | *Teacher* | *Specialization* | | *p* | *l* | *e* | *p* | | | |
| | **Master project in Physics Engineering** | | | | | | | | | | | |
| | *PHYS-599(a)* | *PH* | *Profs divers* | | | 900h | | | 900h | *Sum Win* | *Oral* | *30* |

**Physics options**

| | ***Courses*** | | | ***Master 1*** | | | ***Master 2*** | | | ***Exam Session*** | ***Exam*** | ***Credit*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Language* | *Code* | *Section* | *Teacher* | *Specialization* | | *p* | *l* | *e* | *p* | | | |
| | **Astrophysics III : galaxy formation and evolution** | | | | | | | | | | | |
| *E* | *PHYS-465* | *PH* | *Hirschmann* | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Astrophysics IV : stellar and galactic dynamics** | | | | | | | | | | | |
| *E* | *PHYS-401* | *PH* | *Revaz* | | | | 2h | 2h | | *Sum* | *Oral* | *4* |
| | **Astrophysics V : observational cosmology** | | | | | | | | | | | |
| *E* | *PHYS-402* | *PH* | *Kneib* | | | | 2h | 2h | | *Sum* | *Oral* | *4* |
| | **Biophysics : physics of biological systems** | | | | | | | | | | | |
| *E* | *PHYS-302* | *PH* | *Rahi* | 2h | 2h | | | | | *Win* | *During the semester* | *4* |
| | **Interacting quantum matter** | | | | | | | | | | | |
| *E* | *PHYS-502* | *PH* | | 3h | 1h | | | | | *Win* | *Oral* | *4* |
| | **Introduction to astroparticle physics** | | | | | | | | | | | |
| *E* | *PHYS-439* | *PH* | *Neronov Perrina Savchenko* | | | | 2h | 2h | | *Sum* | *Oral* | *4* |
| | **Magnetism in materials** | | | | | | | | | | | |
| *E* | *PHYS-491* | *PH* | *Zivkovic* | | | | 2h | 2h | | *Sum* | *Oral* | *4* |
| | **Neutron and X-ray Scattering of Quantum Materials** | | | | | | | | | | | |
| *E* | *PHYS-640* | *EDPY* | *Fogh Rønnow Schmitt* | 2h | 2h | | | | | *Win* | *Oral* | *4* |
| | **Particle physics: the flavour frontiers** | | | | | | | | | | | |
| *E* | *PHYS-471* | *PH* | *Marchevski* | | | | 2h | 2h | | *Sum* | *Oral* | *4* |



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| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Particle physics I** | | | | | | | | | |
| *E* | *PHYS-415* | *PH* | *Marchevski* | 2h | 2h | | | *Win* | *Oral* | *4* |
| | **Particle physics II** | | | | | | | | | |
| *E* | *PHYS-416* | *PH* | *Shchutska* | | | 2h | 2h | *Sum* | *Oral* | *4* |
| | **Plasma I** | | | | | | | | | |
| *E* | *PHYS-423* | *PH* | *Theiler* | 2h | 3h | | | *Win* | *Oral* | *6* |
| | **Quantum Computing** | | | | | | | | | |
| *E* | *PHYS-641* | *EDPY* | *Savona* | 2h | 2h | | | *Win* | *Oral* | *4* |
| | **Quantum electrodynamics and quantum optics** | | | | | | | | | |
| *E* | *PHYS-453* | *PH* | *Kippenberg* | 2h | 2h | | | *Win* | *Written* | *6* |
| | **Quantum field theory I** | | | | | | | | | |
| *E* | *PHYS-431* | *PH* | *Riva* | 3h | 2h | | | *Win* | *Oral* | *6* |
| | **Quantum field theory II** | | | | | | | | | |
| *E* | *PHYS-432* | *PH* | *Bellazzini* | | | 3h | 2h | *Sum* | *Oral* | *6* |
| | **Quantum information theory** | | | | | | | | | |
| *E* | *PHYS-550* | *PH* | *Holmes* | | | 2h | 2h | *Sum* | *Written* | *4* |
| | **Quantum physics III** | | | | | | | | | |
| *E* | *PHYS-425* | *PH* | *Yazyev* | 2h | 3h | | | *Win* | *Oral* | *6* |
| | **Quantum physics IV** | | | | | | | | | |
| *E* | *PHYS-426* | *PH* | *Penedones* | | | 2h | 2h | *Sum* | *Written* | *6* |
| | **Quantum transport in mesoscopic systems** | | | | | | | | | |
| *E* | *PHYS-462* | *PH* | *Banerjee* | | | 2h | 2h | *Sum* | *Oral* | *4* |
| | **Relativity and cosmology I** | | | | | | | | | |
| *E* | *PHYS-427* | *PH* | *Penedones* | 2h | 2h | | | *Win* | *Written* | *6* |
| | **Relativity and cosmology II** | | | | | | | | | |
| *E* | *PHYS-428* | *PH* | *Gorbenko* | | | 2h | 2h | *Sum* | *Written* | *6* |
| | **Solid state physics III** | | | | | | | | | |
| *E* | *PHYS-419* | *PH* | *Läuchli Herzig* | 3h | 2h | | | *Win* | *Oral* | *6* |
| | **Solid state physics IV** | | | | | | | | | |
| *E* | *PHYS-420* | *PH* | *Carbone* | | | 2h | 2h | *Sum* | *Oral* | *4* |
| | **Statistical physics III** | | | | | | | | | |
| *E* | *PHYS-435* | *PH* | *Wyart* | 2h | 2h | | | *Win* | *Written* | *6* |
| | **Statistical physics IV** | | | | | | | | | |
| *E* | *PHYS-436* | *PH* | *Kippenberg* | | | 2h | 2h | *Sum* | *Written* | *6* |
| | **Statistical physics of biomacromolecules** | | | | | | | | | |
| *E* | *PHYS-441* | *PH* | *De Los Rios* | 2h | 2h | | | *Win* | *Oral* | *4* |
| | **Statistical physics of computation** | | | | | | | | | |
| *E* | *PHYS-512* | *PH* | *Krzakala Zdeborová* | 2h | 2h | | | *Win* | *Written* | *4* |



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