

Example of masters at the  
Faculty of Physics & Engineering  
University of Strasbourg  
(Unistra)

+ addendum for bachelor in engineering sciences (Fac Phys&Eng. / Univ. Strasbourg)

# University of Strasbourg / master scheme

1st Year / common core

**S1**

**Strengthening/deepening  
theoretical background  
of the bachelor degree**

**S2**

**Introducing specialized  
subjects**

2<sup>nd</sup> Year

**S3**

**Fully specialized  
subjects**

**S4**

**Internship**

## Curricula of M. Sc. in Physics in Azerbaijan and Unistra

Master in Physics	National Standard in Azerbaijan : 120 ECTS	Unistra: 120 ECTS
Humanities	14 (12 %)	
Electives (could be taken from a different faculty, i.e. Biology, Philosophy)		9 (8 %)
Disciplinary	106 (88 %)	111 (92 %)

## Elements of disciplinary subjects

Disciplinary subjects	NS Azerbaijan / 106 ECTS	Unistra / 111 ECTS
Faculty choice	70 (66 %)	51 (46 %)
NS MoE	6 (6 %)	
Student choice		39 (35 %)
Internship / research « vocational issue »	6 (6 %) <b>4 weeks=4 % curriculum / 94 weeks)</b>	30 (27 %) 15 weeks=23 % curriculum / 64 weeks)
Internship / pedagogy « vocational issue »	6 (6 %) <b>4 weeks=4 % curriculum / 94 weeks)</b>	
Academic dissertation	18 (17 %) 12 weeks=13 % curriculum / 94 weeks	

# Master in Physics at University of Strasbourg

Unistra offers a Master Diploma in Physics (within the field 'Sciences & Technology') with **5 specialisations** (5 research-based curricula):

- ♦ **Astrophysics** (research oriented Master leading to a PhD programme)
- ♦ **Condensed matter and nanophysics** (research oriented Master enabling to enter a PhD programme)
- ♦ **Radiation physics, detection, instrumentation and imaging** (possible both professional issue & PhD)
- ♦ **Subatomic physics and astroparticles** (research oriented leading to a PhD programme)
- ♦ **Cell physics** (research oriented leading to a PhD programme)

Offer is based on the supporting research labs

*Reminder: Unistra hosts in total 72 research labs, of which 9 whole institutes (> 100 staff) involve physics oriented research teams.*

# U. of Strasbourg : Example of syllabus for 1st year of Master

Same curricula for all 5 specialisations in Physics in Semester 1 and Semester 2

## S1

**1 – Quantum mechanics & statistical physics / 9 ECTS**

**2 – Programming & present days research in physics / 6 ECTS**

**3 - Experimental physics 1 / 6 ECTS**

**4 – Electives to be chosen by student among the following (2 subjects / 6 ECTS)**

- Mechanics of continuous media
- The constituents of Universe and their observation
- Group theory
- Ionizing radiations and their detection
- General relativity
- Nanostructures and nanophysics
- Mentored project
- Arrow of time & advanced statistical physics
- Variational principles and analytical mechanics
- Introduction to quantum collisions
- Critical phenomena and out of equilibrium statistics

**5 – ‘Free’ electvies (i.e. electives to be chosen by student and validated by the head of master) / 3 ECTS**

## S2

**1 – Nuclear matter, elementary particles, and condensed matter physics / 9 ECTS**

**2 – Computer programming and numerical simulation 1 / 3 ECTS**

**3 – Physics at the lab / 12 ECTS**

**4 - Optional (student choice) 1 subjects / 3 ECTS**

- Particles & astroparticles
- Physics of stars
- Atomic & molecular physics
- Relativistic quantum mechanics
- Mentored project
- Introduction to the physics of living
- Numerical applications in physics
- Soft matter physics
- Optics & photonics

**5 – Free option (validated by the head of master) / 3 ECTS**

# U. of Strasbourg: example of syllabus for 2<sup>nd</sup> year of Master

'Condensed matter physics & nanophysics (research oriented)', Semesters 3 and 4

## S3

**1** – Advanced quantum mechanics – applications to condensed matter physics / **6 ECTS**

**2** – Light-matter interaction – applications to condensed matter physics / **6 ECTS**

**3** – Advanced statistical physics – out of equilibrium processes / **6 ECTS**

**4** – 4 compulsory subjects to be chosen by student / **9 ECTS**

**5** – Free option (validated by the head of master) / **3 ECTS**

**S4 / 15 weeks internship / written report & defense / 30 ECTS**

4 compulsory subjects to be chosen by student (**9 ECTS**), among the following:

- Mentored project: computer processing of a project in physics
- Magnetism and magnetic nanostructures
- Theory and modeling of the electronic structure of solids
- Spintronics
- Optical microscopies
- Interactions in soft condensed matter
- Surfaces and Interfaces in soft condensed matter
- Electron dynamics: charges and spins
- Electronic properties of low dimensional systems
- Biophysics
- Scanning probe microscopies
- Many-body physics applied to condensed matter
- Dynamics of complex systems
- Scattering technics for condensed matter
- Open quantum systems
- Electron microscopy

Important note for the faculties of physics (BSU & SDU) and MoE: it could be considered creating at the faculty of Physics a Bachelor Degree in **Engineering Sciences**: the 1st year could be the same as B.Sc. in Physics and 2<sup>nd</sup> year would offer teaching in engineering sciences.

For ex., at the faculty of physics and engineering of U. of Strasbourg, there is also a **bachelor in engineering sciences**. This one is best suited to apply for master in micro- and nano-electronics, master in mecatronics, master in industrial engineering. The B. Sc. Eng. curriculum is described hereafter

After a bachelor in physics, students may also apply for a master in materials science at the faculty of physics and engineering (master in materials science & engineering)

# Bachelor Engineering sciences / electronics, signal and automatics

## 1st year identical to first year of the bachelor in physics

### S1

#### 1 – Physics 1 / 9 ECTS

- Mechanics 1
- Electrostatics
- Supervised personal work
- Experimental physics 1

#### 2 – Maths 1 / 9 ECTS

- Maths for sciences 1
- Supervised personal work

#### 3 – Chemistry 1 / 6 ECTS

- Architecture of matter
- Transformations of matter 1
- Experimental chemistry 1

#### 4 – Languages / 3 ECTS

#### 5 - University working methodology / 3 ECTS

### S2

#### 1 – Physics 2 / 9 ECTS

- Vibrations & Waves – Geometrical optics
- Mathematical methods for physics
- Experimental physics 2

#### 2 – Maths & Computer science / 9 ECTS

- Maths for sciences 2
- Computer science (Linux environment)

#### 3 – Molecules and bounds / 3 ECTS

#### 4 – Languages / 3 ECTS

#### 5 – Free option / 3 ECTS among

- Chemical equilibria
- Geosciences: the lithosphere
- Case studies in engineering sciences
- Materials of the future
- Mechanics 2
- Special relativity

#### 6 – Personal profesional project / 3 ECTS



# Bachelor Sciences for engineers / electronics, signal and automatics

## 2<sup>nd</sup> & 3<sup>rd</sup> years specifics to the BScE

### S3

**1 – Sciences for engineers 1 (electrical engineering) / 6 ECTS**

- Electricity & Electromagnetism
- Study of an amplification chain

**2 – Sciences for engineers 2 (mechanical engineering) / 6 ECTS**

- General mechanics
- Mechanical construction

**3 – Maths for engineers 1 / 6 ECTS**

- Analysis
- Algebra

**4 – Computer science / 6 ECTS**

- Architecture of computer's OS
- Programming

**5 – Languages / 3 ECTS**

**6 - Personal profesional project / 3 ECTS**

- Corporate communication
- Mentoring of the personal project

### S4

**1 – Electrical engineering 2 / 6 ECTS**

- Fourier's series & tranforms
- Electrotechnics

**2 – Electrical engineering 3 / 6 ECTS**

- Electronics
- Microelectronics

**3 – Maths for engineers 2 / 3 ECTS**

- Functions of sevral real variables

**4 – Thermodynamics / 3 ECTS**

**5 – Materials & processes / 6 ECTS**

- Materials
- Manufacturing processes, assembly tecjhnnologies & metrology

**4 – Languages / 3 ECTS**

**5 – Professional development / 3 ECTS**

- Operator apprenticeship (4 weeks)

# Bachelor Sciences for engineers / electronics, signal and automatics

## 2<sup>nd</sup> & 3<sup>rd</sup> years specifics to the ScE bachelor

### S5

#### 1 – Maths / **6 ECTS**

- Mathematical methods for electronics

#### 2 – Waves and materials / **9 ECTS**

- Waves
- Physics of semiconductors

#### 3 – Electronics 1 / **9 ECTS**

- Signals and systems
- Analog electronics 1

#### 4 – Computer science / **3 ECTS**

#### 5 – Languages / **3 ECTS**

### S6

#### 1 – Electronics 2 / **12 ECTS**

- Analog electronics 2
- Digital electronics
- Introduction to Labview

#### 2 – Converters / **9 ECTS**

- Static transducers
- Electromechanic transducers

#### 3 – Automatics / **9 ECTS**

- Functions of several real variables

#### 4 – Voluntary internship (engineering assistant – 4 to 8 weeks) / **3 ECTS** (extra)

Other issues for graduates in Physics at  
the B. Sc. Level

Fac. Phys&Eng. / Univ. Strasbourg, France

# Master in Applied physics and physical engineering

Accessible to bachelor in engineering sciences or a bachelor in physics (under restriction) : 3 master curricula

- Mechatronics & Energetics
- Micro- and Nano- Electronics (designed bachelor programme described in the previous slides)
- Computational engineering

Each of these curricula may lead to vocational integration or to PhD enrolment within one of the dedicated supporting labs

# Master in Materials science & engineering

Following a bachelor in physics : 3 master curricula

- Materials Engineering & Nanosciences
- Surface Design & Innovative materials
- Polymers Engineering (with a possible French-German track)

Each of these curricula may lead to vocational integration or to PhD enrolment within one of the dedicated supporting labs